Leveraging Mobile Business Intelligence to create Strategic Business Value

A Dissertation

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By

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Abstract

Currently, there is a growing need for mobile Business Intelligence (BI) in the business world as the nature of work is changing and employees are more mobile than ever before. Mobile BI promises portability and pervasive access to BI, making it a topic high on many directors' agendas; however the tangible and intangible benefits of mobile BI are still not well understood. Coupled with this, BI practitioners' are sceptical about the real business value of delivering BI reports to mobile devices and how this undertaking can bring about organizational changes in the long run.

As the field of mobile BI is still in its infancy, there is a lack of research which addresses the business value of mobile BI. The existing studies in this research area have been focused on adoption and implementation strategies. This study therefore attempts to address the gap by investigating how mobile BI can be utilised to enhance organizational performance and also contribute towards strategic business value. In light of this, an extensive literature review was conducted which revealed that mobile BI usage can result in benefits, such as improved employee performance management, organizational agility and customer satisfaction. A conceptual model was developed based on the literature and this model acted as the framework for investigating the research problem.

This study utilized a mixed methods strategy and collected data from 55 mobile BI users via a web based survey platform. Regression analysis was used to test the research propositions and this resulted in five out of the six research propositions being supported. Deductive thematic analysis was used for the open ended questions in the survey.

The findings asserted that indeed, mobile BI had a positive impact on performance management, organizational agility and customer satisfaction. Customer satisfaction and organizational agility were in turn both found to be significant predictors of strategic business value. Performance management, however, was not found to be a significant predictor of strategic business value. It can therefore be concluded that mobile BI is able create strategic business value through increasing levels of organizational agility and customer satisfaction.

Acknowledgments

I wish to extend my sincere gratitude to my supervisor Professor Derek Smith for his consistent support and assistance through useful comments and suggestions. I would also like to extend my gratitude to Professor Mike Kyobe for the research foundations he laid down during coursework stage of the degree. I am also grateful to the Masters 2014 class for all the help and encouragement which I have received.

Dedications

I dedicate this dissertation to the Kashora family, Mr Trust Kashora, Mrs Phoebe Kashora and Tafadzwa Kashora. Thanks for always believing in me. I also dedicate this dissertation to my wonderful husband Larry Tsongoro for standing beside me from the beginning. Last but not least I dedicate this dissertation to a fellow Master's student who has become a wonderful friend and inspiration Zimasa Ndamase, keep reaching for the sky.

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List of Common Acronyms

BI……Business Intelligence

CRM……..Customer Relationship Management

GUI……..Graphical User Interface

ERP……..Enterprise Resource Planning

IS……Information Systems**

IT……Information Technology**

OLAP……..Online Analytical Processing

PC……Personal Computer

PDA……Personal Digital Assistant

ROI……Return On Investment

TAM……..Technology Acceptance Model

UCT……..University of Cape Town

URL……..Uniform Resource Locator

**Please note the terms IS and IT will be used interchangeably in this dissertation

1 Introduction

1.1 Context

Africa has over 695-million mobile subscriptions and a penetration rate of 65%, with South Africa being one of the countries with a mobile penetration rate close to a 100% (SouthAfrica.info, 2012). South Africa has the second highest smartphone penetration in Africa of 19%. Thus, South Africa is an interesting country to explore usage of mobile devices in the African Continent.

In today's world, organizations need to be more agile in their operations due to faster decision cycles, increased competitive pressures for opportunities and constant changes in the global economy (Brockmann, Kmieciak, Diederich, & Stieglitz, 2012). One way organisations can achieve greater agility is by utilising Business Intelligence (BI), as it helps firms to increase their ability to sense and detect environmental changes (Chen & Siau, 2011). Mobile technology is another means to support agility as it provides efficient ways of spreading data and getting analytics applications to the users much quicker (Stodder, 2013).

Broadly speaking, mobile BI and analytics enable mobile decision support via devices such as smartphones and tablet PC's. Currently, there is a growing need for mobile BI in the business world as the nature of work is changing and employees are more mobile than ever before (Ventana, 2011). Mobile devices assist in making information more ubiquitous such that workers are no longer bound to the office (Brockmann et al., 2012). Employees' ability to do productive work while out on the road, via mobile BI, can improve organizational performance and competitiveness (Ventana, 2011).

Another factor contributing towards the rise of mobile BI is that employees are now using self-purchased mobile devices for work purposes. This is due to the fact that employees are now so accustomed to the advanced features and intuitive data access of their mobile devices in their personal lives that they now also require this in their work lives (Ventana, 2011). Previously the limitations of screen-size on smartphones prevented delivering functionality such as full featured dashboards or interactive reports. However, with the

advent of tablets such as the iPad, this issue can now be addressed (Airinei & Homocianu, 2010; Ventana, 2011).

Mobile BI is high on many directors' agendas as it offers portability and easy access to BI (Watson, Wixom, & Yen, 2013). According to O'Donnell et al. (2012) mobile BI was ranked as the topmost critical issue being faced by BI practitioners in Australia. This was due to senior executives demanding reports on their iPads; however BI practitioners were not convinced about the real business value to be gained from this undertaking. Verkooij and Spruit (2013) agree that whilst there is much discussion about implementing mobile BI, the business value of mobile BI remains quite poorly understood. Tona and Carlsson (2013) also point out the present need for practitioners' to understand how mobile BI usage affects decision making processes and brings about organizational changes in the long run.

The South African Government statistical body, Stats SA, used mobile BI to disseminate the results of the 2011 census. StatsSA was able to offer interactive graphical displays of census data to the public, through the use of iPhone and iPad custom built applications made with Roambi mobile BI software (Twentyman, 2012). This example shows the great potential of mobile BI to add value in the government arena as well as other spheres of society

1.2 Necessity for and Value of Research

The main purpose of this research is to investigate the ways mobile BI is able to enhance an organization's performance and contribute towards strategic business value.

The research objectives for this research are as follows:

- To explore how mobile BI enables an organization to be more agile through improved sensing and responding to market conditions.
- To explore the ability of mobile BI to improve employee performance management through more constant access to actionable information.
- To explore how mobile BI can lead to improved customer satisfaction and improved responsiveness to customer requests.

The existing research on mobile BI has been based on the adoption and implementation of mobile BI. Due to the field of mobile BI still being in its infancy, there is a need for research which addresses the business value of mobile BI. Research such as this, aims to address this gap by proposing and testing a framework which shows how mobile BI can be used to contribute towards strategic business value. The findings of this study can be useful to either organizations planning to adopt mobile BI or those that have adopted it but are still not deriving business value from the initiative.

1.3 Overview of dissertation

The rest of the document is organised as follows – *Chapter 2* provides a review of the literature on business value concepts in both the business intelligence and mobile environment. The key concepts from the literature review are presented in a derived conceptual model. This model acts as a framework for investigating the current research problem. *Chapter 3* presents the research question and objectives of this study as well as the research propositions based on the literature review. It describes the research philosophy, research instrument, sampling, data collection and data analysis techniques. *Chapter 4* presents the statistical techniques that were used to describe and consolidate the data being studied, assess the reliability of measurement scales and also test the research propositions. *Chapter 5* relates the findings to the questions and propositions under investigation. This chapter offers reasons to support and or explain the findings of this study and also discusses the contribution of this research. *Chapter 6* draws together the final arguments of the research and offers implications for practice and also suggestions for future research.

2 Literature Review

Mobile BI is the most recent innovation to Business Intelligence which carries with it great promise (Dresner Advisory, 2012). However, according to O'Donnell et al. (2012) BI practitioners are sceptical concerning the true value of mobile BI despite the enthusiasm of senior executives. Yogev, Fink, and Even (2012) posit that investment in information technology without the use of additional capabilities does not lead to competitive advantage. This is due to the fact that technology alone is easy to imitate.

This chapter provides a review of the research literature on business value concepts in both the business intelligence and mobile environment. It is organised as follows: *Section 2.1* discusses the business value of IT. *Section 2.2* clarifies the concepts underlying business intelligence and it also brings to light the current evolution of BI. *Section 2.3* provides a definition for mobile BI and discusses related topics such as mobile added value, user acceptance of mobile BI systems and implementation of mobile BI. *Section 2.4* discusses the business value created by mobile BI through improving performance management, organizational agility and customer satisfaction. *Section 2.5* presents the key concepts of the literature review in a derived conceptual model. The model acts as a framework for investigating the current research problem. *Section 2.6* provides a summary of the entire literature review.

2.1 Business Value of IT

Schryen (2012) offers the following definition for IS Business Value, "*IS Business value is the impact of investments in particular IT assets on the multidimensional performance and capabilities of economic entities at various levels, complemented by the ultimate meaning of performance in the economic environment*" (pg 141). In this definition the ultimate meaning of performance refers to what subsequently occurs if the desired outcome such as time or cost savings is achieved through the introduction of new technology.

The Business value of IT is used to describe the impacts of IT on organizational performance which can be measured in terms of productivity enhancement, profitability improvement, employee and customer satisfaction and competitive advantage (Markus & Soh, 1995; Melville, Kraemer, & Gurbaxani, 2004; Scheepers & McKay, 2004). The IT Business Value model comprises three domains which shape the relationship between IT and organizational performance, namely the focal firm, the competitive environment and the macro environment (Melville et al., 2004). Organizational performance is an aggregated view of the Business Intelligence related performance in an organization, whereby Return on Investment (ROI) and sales growth represent organizational objectives that can be used to measure organizational performance (Elbashir, Collier, & Davern, 2008). The Resource-based view theory which explains how firms can gain competitive advantage will be discussed next as well as the dynamic capabilities extension to this theory.

2.1.1 Resource-Based View Theory

Resource-based View (RBV) theory suggests that the long term competitiveness of an organization is based on it having resources "*that differentiate it from its competitors, that are durable and, that are difficult to imitate and substitute*" (Rangone, 1999, pg 233). The resources that the firm possesses can be classified in various ways for example into similar classes such as financial resources, physical resources (e.g. plants and machines), human resources, technological resources, reputation and organisational resources (Rangone, 1999). However resource-based theory only focuses on critical or strategic resources which

form the basis of the company's sustainable competitive advantage based on three basic capabilities namely innovation capability, production capability and market management capability (see Figure 2.1).

In the resource tree model innovation capability refers to a companys' ability to develop new products and achieve superior technological performance. As a result the RBV theory can also be used in an IT context to evaluate how IT can be used for competitive advantage (Melville et al., 2004). Yogev et al. (2012), however, acknowledge that investment in IT alone without additional capabilities may not result in competitive advantage as IT resources may be easy to imitate and substitute.

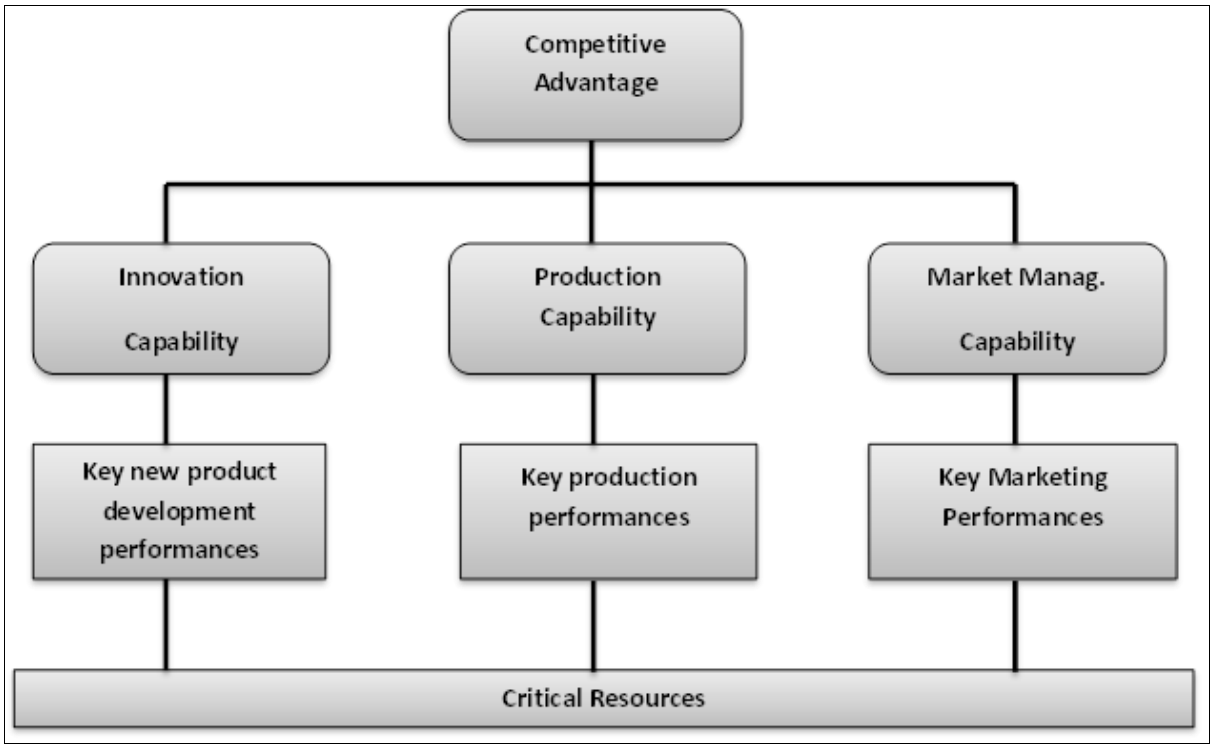


Figure 2.1: The resource tree

According to Picoto, Belanger, & Palma-dos-Reis (2012) whilst IT infrastructure components are commodities, the manner in which they are integrated and aligned with a company's business strategy is complex and potentially a differentiator. Picoto et al. (2012) further suggest that organizations which are able to incorporate mobile business more comprehensively into their value chain activities can potentially reap higher business value from using mobile business technology.

The next section will look at the dynamic capabilities of a firm, and also how dynamic capabilities can extend RBV theory to cater for an ever changing environment.

2.1.2 Dynamic Capabilities of a firm

Dynamic capabilities can be defined as *"The ability to sense and then seize new opportunities, and to reconfigure and protect knowledge assets, competencies, and complementary assets with the aim of achieving a sustained competitive advantage"* (Augier & Teece, 2009, pg 412). According to Augier and Teece (2009) dynamic capabilities comprise the capabilities to sense and seize opportunities as well as managing threats which in turn offer firms a chance of superior profitability over time.

Eisenhardt and Martin (2000) suggest that RBV theory is not sufficient to explain how certain firms retain their competitive advantage in instances of rapid and unpredictable change. Melville et al. (2004) agree that the dynamic capabilities extension to RBV is useful in understanding ever-changing dynamic markets. Dynamic capability is thus an underlying theory for agility which relates to firms succeeding in rapidly changing environments (Chen & Siau, 2011; Overby, Bharadwaj, & Sambamurthy, 2006). In situations where a competitive landscape is shifting, the dynamic capabilities which managers use to integrate, build and reconfigure resources become the real source of sustained competitive advantage (Eisenhardt & Martin, 2000).

Business Intelligence capabilities are key functions that help an organization improve its agility and perfromance (Jones et al., 2013). IT and business intelligence in particular, can therefore play a role in creating competitive advantage and strategic business value for the organization. In the next section the "ends-ways-means" model is discussed and it showcases how IT assets can be capitalized upon to ultimately deliver business value.

2.1.3 "Ends-ways-means" Model

Ramadani (2009) suggests that business strategy can be executed via an "ends-ways-means" model (see Figure 2.2). IT assets are the means or the value initiation step as they carry the potential value through the technical infrastructure, technical and managerial competencies and data and business applications. The technical infrastructure referred to can be used to

support different business functions such as sales, purchasing and customer support. The ways represent the value conversion process which converts potential value into delivered value. The ends represent the value realization step and the measures of IT Business value are either strategic (competitiveness, effectiveness, return on assets), tactical (improvement of relationships with trading partners) or operational (efficiency, productivity, quality).

This "ends-ways-means" model can be illustrated using the simple example of a Customer Relationship Management (CRM) system which would be the means by which value is eventually realised. The ends of the realised value would be increased sales and the ways that this is achieved would be combining the new CRM technology with new work processes. This example can also extend to mobile CRM solutions and mobile BI as they can also be the means through which increased customer marketing, sales and customer satisfaction can be reached when mobile technology is integrated into existing business processes.

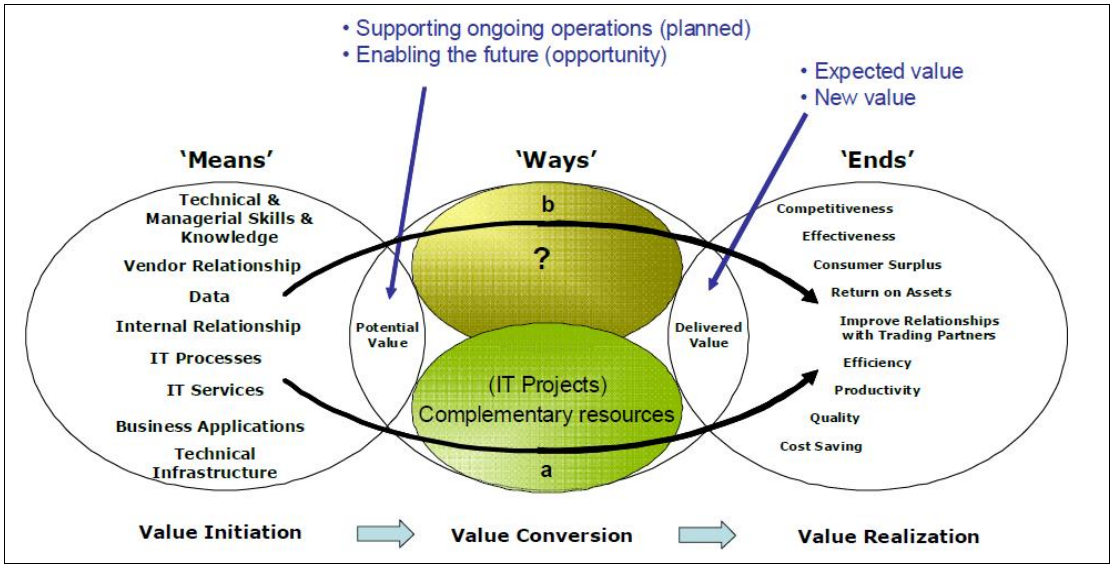


Figure 2.2: "End – ways – means" Model (Ramadani, 2009)

The next section looks at a framework originally proposed by Markus and Soh (1995) and extended by Crossland (2010) which shows how BI assets can ultimately lead to improved business value and benefits realisation.

2.1.4 Process model for Evaluation of BI

A conceptual process framework was developed by Markus and Soh (1995) which suggested that IT investments lead to IT assets (conversion process), IT assets lead to IT impacts (IT use process) and IT impacts lead to organizational performance (competitive process).This framework was based upon a process theory which is used when there is outcome uncertainty such as with the case of investigating the business value of IT (Markus & Soh, 1995). Crossland (2010) adapted this model to highlight the importance of the strategic alignment of business strategy in general and BI in particular. Crossland (2010) also extended the original model to contain a Benefits Realisation Management Process which involves measuring and monitoring the actual value derived from BI. This extended model is shown in Figure 2.3.

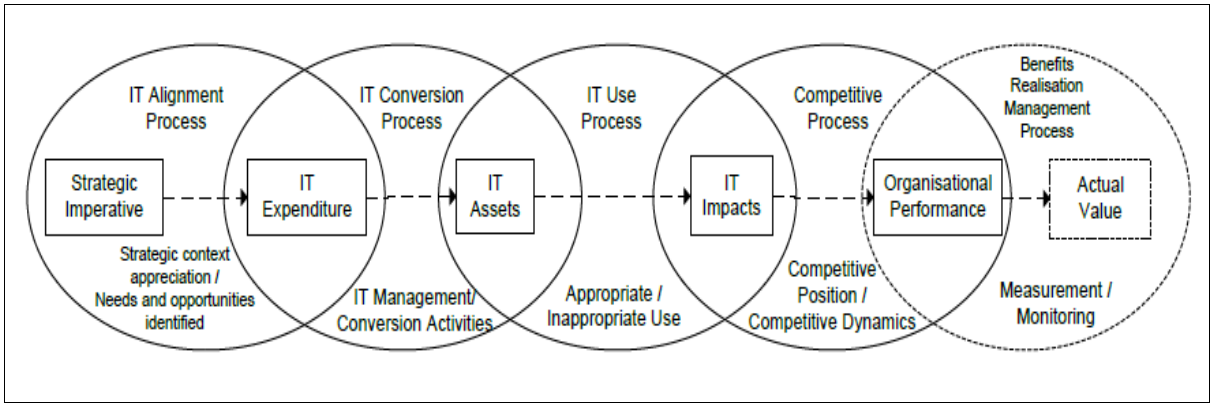


Figure 2.3: Business Value of BI (Crossland 2010)

The next section of the literature review focuses on how organizations have turned to BI to improve their decision making processes, organizational performance and IT business value.

2.2 Evolution of Business Intelligence

Business Intelligence (BI) is a term that was first introduced in 1989 by Howard Dressner, a research fellow at Gartner group, and he described it as a method to improve decision making using fact based support systems (Yogev et al., 2012). BI systems *"combine data gathering, data storage, and knowledge management with analytical tools to present complex internal and competitive information to planners and decision makers"* (Negash, 2004, pg 178). This definition reflects the belief that BI systems can supply actionable information at the right time, in the right format to the right location to help decision makers (Negash, 2004). Another definition for BI, which focuses on organisational performance is as follows; *"BI is a system which combines both technical and organizational elements that presents its users with historical information for analysis to enable effective decision-making and management support, with the overall purpose of increasing organisational performance"* (Isik, Jones & Sidorova, 2013,pg 13).

Business analytics refer to the integral analytical component of BI, and has recently come to include Big Data Analytics which is comprised of very large and complex data sets (Chen, Chiang, & Storey, 2012). The field of Business Intelligence and Analytics (BI&A) has undergone an evolution starting with BI 1.0 in the 1990's as can be seen in Table 2.1. The key foundations of BI&A were data management and warehousing. BI&A 1.0 relied heavily on data collection, extraction and analysis technologies such as data mining and statistical methods(Chen et al., 2012). According to a Gartner report by Sallam, Richardson, Hagerty and Hostmann (2011) eight of the 13 core capabilities currently considered essential for BI platforms can be found in BI&A 1.0. These eight capabilities are as follows; reporting, dashboards and scorecards, ad hoc query, search based BI, OLAP, interactive visualisation and predictive modelling.

Dinter and Lorenz (2012) posit that the term web 2.0 is an abstract concept which refers to the paradigm shift from a passive manner of internet usage to an active and participating way of using the internet. Yogesh, Williams, Mitra, Niranjan and Weerakkody (2011) propose that while the exact definition of web 2.0 is unclear, its underlying features are shown through flexibility of access, interaction, mobility, multimedia capability,

participation, informality and feedback. According to Dinter and Lorenz (2012, pg3) social media "*is used by individuals and communities to share, co-create, discuss and modify user generated content"*. Social BI is thus the integration of social media into the BI environment. There are currently a number of interchangeable terms relating to Social BI in use such as social media analytics, social media intelligence, social intelligence and business intelligence 2.0 (Dinter & Lorenz, 2012). Chen et al. (2012) confirm the notion that BI 2.0 involves user generated content from various online social media such as forums, online groups, web blogs, social networking sites and social multimedia sites.

Table 2.1: Evolution of Business Intelligence (Chen et al., 2012)

Table 1. BI&A Evolution: Key Characteristics and Capabilities			
	Key Characteristics	**Gartner BI Platforms Core Capabilities**	**Gartner Hype Cycle**
BI&A 1.0	DBMS-based, structured content • RDBMS & data warehousing • ETL & OLAP • Dashboards & scorecards • Data mining & statistical analysis	• *Ad hoc* query & search-based BI • Reporting, dashboards & scorecards • OLAP • Interactive visualization • Predictive modeling & data mining	• Column-based DBMS • In-memory DBMS • Real-time decision • Data mining workbenches
BI&A 2.0	Web-based, unstructured content • Information retrieval and extraction • Opinion mining • Question answering • Web analytics and web intelligence • Social media analytics • Social network analysis • Spatial-temporal analysis		• Information semantic services • Natural language question answering • Content & text analytics
BI&A 3.0	Mobile and sensor-based content • Location-aware analysis • Person-centered analysis • Context-relevant analysis • Mobile visualization & HCI		• Mobile BI

According to Chen et al. (2012) BI 3.0 is depicted by mobile and sensor based content. They go on to say that mobile and internet enabled devices possess the capabilities to support location aware, person-centred and context-relevant analysis. Mobile BI provides a novel way of delivering BI content on next generation mobile devices as opposed to traditional BI which is accessed via desktop computers (Peters, Popovic, Isik, & Weigand, 2014; Tona & Carlsson, 2013). They further state that that the mobile industry is experiencing remarkable growth and a new employee driven IT revolution is currently taking place. This revolution is called IT consumerization and it can be seen by increasing numbers of organizations allowing employees to use consumer devices at work hoping to see expected benefits of innovation, productivity and employee satisfaction (Koch & Curry, 2014). The next section looks into the business value of BI.

2.2.1 Business Value of BI

Davenport (2006) suggests that organizations competing on the basis of business analytics must have fact-based decision-making, facilitated by tools such as BI, as part of their culture. According to Watson and Wixom (2007) organizations are only able to harness the value of BI when users access data from the data warehouse and use it to make decisions. Elbashir et al. (2008) agree that both the strategic positioning and dynamic capability perspectives support the view that extensive BI system usage can be an enabler of business value. Organizations have been found to be more successful with BI when the following preconditions are met; senior management drive the use of BI, there is alignment between business and BI strategies, strong decision support data infrastructure and effective BI governance (Watson & Wixom, 2007).

BI capabilities are the key characteristics of BI that help an organization improve its performance and become more agile (Isik et al., 2013). According to Elbashir et al. (2008) in order for BI to create business value it is necessary to have a common understanding of BI capabilities and also how these capabilities can be leveraged to improve decision-making. Yogev et al. (2012) support the notion that BI business value stems from BI capabilities and not directly from BI assets such as the physical BI system or the BI human assets that implement and manage the system.

There are two BI capabilities which organizations can use to differentiate themselves from their competitors namely strategic and operational BI capabilities (Yogev et al., 2012). Business Intelligence offers strategic use in terms of corporate performance management, optimizing customer relations, packaged standalone BI applications and management reporting of business intelligence (Negash, 2004). Strategic business value with BI comes from creating competitive advantage through supporting strategic objectives such as identifying opportunities and threats, whilst the operational business value of BI is through improving internal processes such as enhancing customer relations (Yogev et al., 2012). The next section of the literature review focuses on the most recent innovation to BI, which is mobile BI.

2.3 Mobile Business Intelligence

Mobile BI provides a novel way of delivering BI content on next generation mobile devices as opposed to traditional BI which is accessed via desktop computers (Peters et al., 2014; Tona & Carlsson, 2013). As shown in Figure 2.4, Mobile BI is the second stage in a series of steps which start with Mobile Information Exchange and results in Mobile Knowledge Management (Derballa & Pousttchi, 2004). Mobile Knowledge Management describes a situation whereby mobile communication techniques and mobile devices are used to facilitate knowledge management in an organizational setting (Derballa & Pousttchi, 2004).

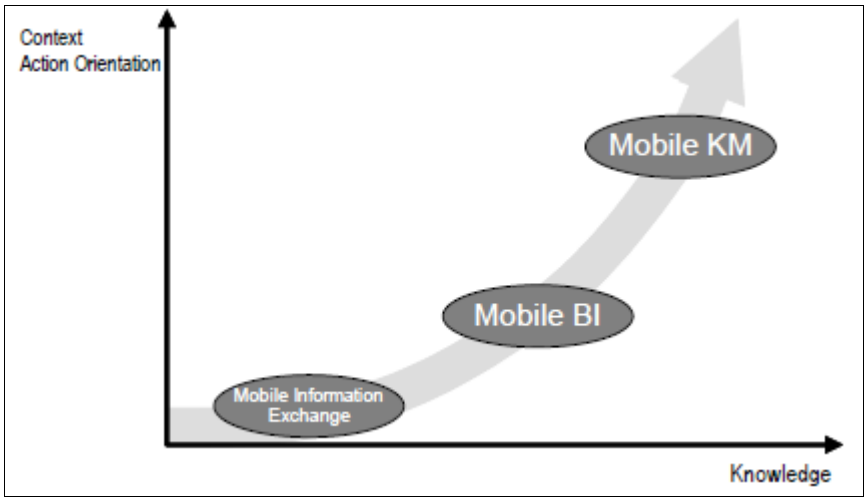


Figure 2.4: Mobile Knowledge Management (Derballa & Pousttchi, 2004)

There are a number of definitions for mobile BI available in the research literature. Mobile BI can be defined as "*the capability of the organization to deliver relevant and timely data to anyone, whenever they need it, wherever they are, regardless of the device used to access that data*" (Pulipati, 2012, pg370). Alternatively mobile BI can also be defined as "*a procedure in which data critical for making decisions is made available to end users in appropriate applications and devices that can be in any way considered mobile. This allows users to make their decisions much faster and more accurately"* (Brozin & Stipić, 2011, pg 1560).

The second definition offered for mobile BI is preferred for this study as it highlights that mobile BI is similar to traditional BI as it is largely concerned with enabling faster and better

decisions. Brozin and Stipić (2011) posit that mobile BI is simply another method of delivering data within the traditional existing BI system.

The second definition of mobile BI however still needs modification, as this study will only deal with certain mobile devices. For the purposes of this paper mobile devices are "*those devices, which are solely designed for the wireless and mobile use. To this group belong primarily smartphones, PDAs, Tablet-PCs and mobile phones. Due to the fact that laptops do not have the always-on character and the compact size of mobile devices, they are not considered as a part of the mobile devices in a narrower sense"* (Mladenova, Homann, Kienegger, Wittges, & Krcmar, 2011, pg3).

This study will adopt a definition of mobile BI which will be crafted from the definitions offered above. The definition that will henceforth be used in this study is as follows:

> *Mobile business intelligence is a procedure in which data critical for making decisions is made available to end users in appropriate applications and mobile devices such as smartphones and Tablet-PCs.*

The review now turns to some of the benefits or added values which organizations seek to attain through using mobile BI.

2.3.1 Mobile Added Values

Mobile added values (MAV) is a term used by some researchers to identify the advantages gained from using mobile technology as opposed to using e-business (Mladenova et al., 2011; Picoto et al., 2012). Pousttchi, Weizmann and Turowski (2003) suggest that MAVs refer to the properties and utilization of mobile technology. According to Picoto et al. (2012) the time and space independence created by MAVs can generate a unique value proposition for mobile business.

MAVs consist of ubiquity, context sensitivity, identifying functions as well as command and control functions (Derballa & Pousttchi, 2004). Ubiquity is the ability to send and receive data anytime from anywhere (Pousttchi et al., 2003). Context sensitivity on the other hand allows services to be personalised (for example, location-based advertising), and this can result in higher levels of innovation, efficiency and effectiveness (Pousttchi et al., 2003).

Identifying functions refer to the mobile devices ability to authenticate the user whilst command and control functions relate to how mobile devices can be used as a remote control for any application or device (Derballa & Pousttchi, 2004). According to Pousttchi et al. (2003) command and control functions can result in innovation and efficiency added values and even ultimately result in macroeconomic added value (Pousttchi et al., 2003).The next section of the literature review discusses the prerequisites for implementing mobile BI which are specifically; assessing the business case and creating a mobile BI strategy.

2.3.2 Fit Viability Model

Pulipati (2012) suggests that organizations should not just jump into implementing mobile BI because the benefits seem attractive but rather that the initiative should be justified and the mobile BI strategy should align with the overall BI strategy. The Fit Viability Model as discussed by Liang, Huang, Yeh, and Lin (2007) is applicable in this context. "*A fit viability model combines the theory of task/technology fit with the general notion of organizational viability of IT*" (Liang, Huang, Yeh, & Lin, 2007, pg 1155). The task/technology fit model is made up of task, technology and individual characteristics and it describes the fit between the technology option and the given task requirement as it relates to an individual's performance (Pulipati, 2012; Yan & Lihua, 2005).

In a mobile commerce context, fit would measure the extent to which mobile technology meets location-sensitive and time-critical requirements due to mobility and reachability capabilities (Liang et al., 2007). Viability would refer to the organizational economic and infrastructure readiness to implement and support mobile technology (Pulipati, 2012). Yan and Lihua (2005) suggest that a user's evaluation of task/technology fit has an impact on the actual usage of mobile applications in business.

According to Mladenova et al. (2011) an activity is only eligible for execution by use of mobile technology if mobile use promises achieving additional benefits which would not otherwise be obtained. The mobile eligibility of a business process is made up of the mobile capability of that activity and the business value to be gained from it (Mladenova et al., 2011; Pousttchi & Habermann, 2009). The mobile capability of the activity can be judged by the activity's requirements and demands and also the typical characteristics of the mobile

device (Mladenova et al., 2011). According to Eckerson (2011), a task should be performed using mobile BI if the task needs to be addressed immediately; can be easily understood and if the information loses value if not acted upon immediately. The next section offers an overview of the different methods through which mobile BI can be implemented.

2.3.3 Implementation of Mobile BI

While penetration of Mobile BI is fairly modest at the moment, some organisations are setting aggressive implementation plans through 2015, pointing to an increased adoption of mobile BI in the future (Brockmann et al., 2012; Dresner Advisory, 2012). Conversely, some organizations are currently experiencing issues with their existing BI implementations and will therefore not be eager to invest in mobile BI (Bitterer, 2011). Many other organisations have concerns over mobile systems and data security (Bitterer, 2011; O'Donnell et al., 2012; Pulipati, 2012).

Mobile BI can be implemented either via native applications or through a web-based browser (Eckerson, 2011; Pulipati, 2012). Mobile BI poses a challenge for companies of how to secure and support personal devices running on various platforms and versions whilst also containing both corporate and personal applications (Eckerson, 2011). Eckerson (2011) also posits that it is easier to enforce security with browser-based applications as all data, codes and passwords are managed centrally protecting sensitive corporate data.

According to Verkooij and Spruit (2013) mobile BI vendors have developed various kinds of mobile BI deployment frameworks such as MicroStrategy offering native applications whilst Qlikview offers mobile web reporting. They further posit that there is no main consensus amongst mobile BI vendors as they also vary in the deployment method they support for different operating systems. In contrast Eckerson (2011) suggests that an advantage of implementing via a web based browser is that it is device independent. Pulipati (2012) defends however that native applications offer benefits of faster performance, in depth mobile device features and offline access. Verkooij and Spruit (2013) posit that there is a third hybrid approach to deploy mobile applications. This approach involves "*rendering HTML content inside a native application container and behaving largely like their web-based counterparts*" (Tapadinhas, 2012, pg 1).

Software like SAP Fiori, for example, offers a collection of applications which work seamlessly across desktop, tablet and smartphone devices. SAP Fiori Business Suite applications are categorized into one of three types namely analytical, factsheets and transactional. Analytical applications comprise 42% of the suite, factsheets make up 30% of the suite and the remaining 28% consists of transactional applications as can be seen in Figure 2.5 (Moy, 2014). The software is targeted at different roles such as managers, sales representatives and purchasing agents. Some sales representative applications available on SAP Fiori are designed to improve employee productivity when on-the-go include creating sales orders and checking price and availability (SAP, 2013).

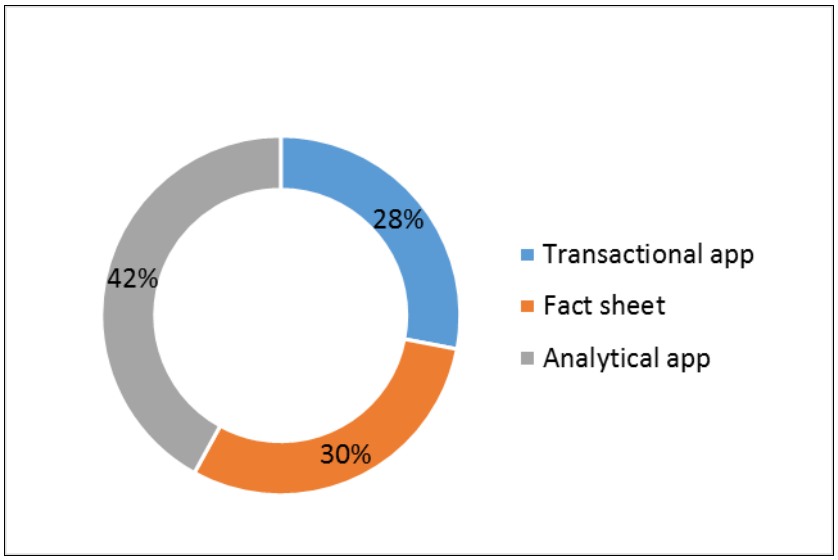


Figure 2.5: Breakdown of SAP Fiori applications by type (Moy, 2014)

Next the literature review looks at some of the trust and security concerns associated with implementing mobile BI.

2.3.4 Trust and Security

Data security and privacy concerns comprise the biggest barrier for organizations to adopt Mobile BI more readily (Pulipati, 2012). Trif and Visoiu (2011) suggest that mobile BI applications allow users to access sensitive information and reports from outside the organization, thus creating a need for the security of this information. Verkooij and Spruit (2013) also posit that the computing power available in mobile devices introduces security threats on all the three information security dimensions of confidentiality, integrity and availability. Brockmann et al. (2012) agree that mobile BI systems have more success factors

with regards to trust than traditional BI systems due to the technical properties of mobile devices which cause privacy and security concerns for the users.

According to Basole (2007) security is a major inhibitor to the adoption of mobile business solutions, due to concerns on how to protect mobile devices from theft, intrusion and viruses. The Bring Your Own Device (BYOD) phenomena is a large contributor to such security issues as connecting personal devices to the company network can introduce malware to the network and also result in company sensitive information residing on devices that are easily lost or stolen (Miller, Voas, & Hurlburt, 2012). Brockmann et al. (2012) suggest that the user's trust in mobile services is a result of perceived reliability of the technology, reliance on the service and user confidence in the security of their personal data. Brockmann et al. (2012) found trust to be one of the success factors for the user acceptance of mobile BI systems; the next section reflects on all the success factors that these authors found to be relevant.

2.3.5 User Acceptance of Mobile BI Systems

Brockmann et al. (2012) conducted a study on the challenges and success factors of mobile BI adoption, particularly looking at accessing vast amounts of data and coping with the limited technical properties of mobile devices. The authors explored various user acceptance models such as Theory of Reasoned Behaviour and Theory of Planned Action searching for a model that was most applicable to mobile BI. The specific model, Technology Acceptance Model for Mobile Services (TAMMS), was seen to fulfil this requirement. TAMMS was a specific extension of the original Technology Acceptance Model (TAM). The success factors for user acceptance of BI systems and mobile systems were then categorized based on the TAMMS factors (namely, perceived ease of use, perceived value, trust and perceived ease of adoption). The authors then proceeded to merge the influence factors of mobile and BI systems to create success factors for mobile BI systems depicted in the Table 2.2. Most of the success factors identified for mobile BI were related to perceived value and perceived ease of use and centred around the Graphical User Interface (GUI) design.

Brockmann et al. (2012) determined that the success factors necessary with regards to the perceived value of BI systems were up-to-date data, the use of dashboards to monitor key

metrics and delivering fast response times. While the success factors of mobile business systems arise from technical properties of the device itself, the need for up-to-date information was a common theme between BI systems and mobile systems (Brockmann et al., 2012).

According to Tapadinhas (2012) anywhere and anytime accessibility is one of the success factors of mobile BI user acceptance. Peters et al. (2014) advocate that the improved accessibility from mobile technologies can positively impact mobile BI as has already been seen with mobile banking.

Brockmann et al. (2012) suggested the consumption of reports via user friendly interfaces and automated delivery processes were key success factors when looking at perceived ease of use of BI systems. Peters et al. (2014, pg4) concur that "appealing and attractive visualisations are one of the features that make BI attractive for business users". The perceived ease of use of mobile systems, however, focused on features such as designing for mobility and fluent navigation on a smaller screen (Brockmann et al., 2012).

Table 2.2: User Acceptance of Mobile BI Systems (Brockmann et al., 2012)

Influence Factor	Success Factor
Perceived Value	Content should be comprehensive, topical and familiar
	Ad-hoc access and up to date information
	Dashboard to monitor key metrics
	Seamless Service/integrated solution
	Deliver performance/fast response
Perceived ease of use	Fluent navigation on a small screen
	Designing for mobility and momentary usage e.g. quick close function
	Simple setup and login procedures
	Notifications/Alerts/Other automated information delivery processes
	Easy creation and consumption of reports
	Seamless service/integrated solution
	Flat reports with minimal drill down
Trust	The user should be able to rely on the service
	The privacy of the user must be protected
	Ensure secure delivery of the information and enforce security guidelines
Perceived ease of adoption	Provided utility needs to be communicated
	Intuitive GUI (consistent look and feel) and easy installation
	Designing for easy integration into the work processes

Clear help desk and training policies

One of the success factors relating to the perceived value of mobile BI is the ability to monitor key metrics related to performance using dashboards. The next section discusses how mobile BI creates business value and improves organizational performance

2.4 Business Value of Mobile BI

Mobile BI is a topic surrounded by much hype and interest however BI practioners are skeptical of the real value associated with mobile BI.In contrast Picoto et al. (2012) posit that organizations implementing mobile BI are likely to reap benefits, such as increased productivity and customer satisfaction, if they are able to effectively leverage their mobile technology to improve their existing processes. This section of the literature review discusses how mobile BI creates business value through improving performance management, customer satisfaction and organizational agility. The section also highlights the need for high quality information as a prerequisite to achieving business value with mobile BI.

2.4.1 Performance Management

Performance management is the process of establishing a consensus about what the organizations goals are, how they are to be achieved and also finding an optimal way of managing people to achieve those goals (Buchner, 2007). The performance management process usually consists of goal setting, performance monitoring, performance appraisal and feedback and improved performance (Gruman & Saks, 2011). Performance management is of high importance as organizations are looking internally for productivity and performance gains due to the harsh economic climate they operate in (Buchner, 2007). Only a small number of employees, however, believe in the effectiveness of their company's performance management process and thus performance management usually ranks lowest on employee satisfaction surveys (Gruman & Saks, 2011).

Balanced Performance measurement frameworks such as the Balanced Scorecard and Performance Prism can be used to define performance and also to identify the factors to measure performance (Lonnqvist&Pirttimaki, 2004). The performance measurement system

is driven by the organisation's vision and can be used as a tool to communicate and implement strategy in the organization (Lonnqvist&Pirttimaki, 2004). Ariyachandra and Frolick (2008) suggest that a Business Performance Management framework is composed of four core steps; strategize, plan, monitor and analyse and take corrective action. The first two steps represent formulating the business strategy whilst the last two steps define how to modify and execute the strategy.

Atkinson (2012) suggests that the monitoring of performance consists of regular progress reporting when delivering against strategic and financial objectives using Key Performance Indicators (KPIs) among other tools. Tona and Carlsson (2013) suggest that mobile BI alerts can be used to focus the attention of decision makers to be more aligned with the company's goals and objectives. Some BI software (such as Roambi) currently offers a mobile BI application for Sales Representatives which allows them to perform sales performance management by tracking their actual sales attainment against their sales targets (Roambi, 2013).

Verkooij and Spruit (2013) posit that mobile BI improves the efficiency and effectiveness of mobile processes through access to key information anytime and anywhere. Picoto et al. (2012) agree that usage of mobile business applications can result in improved internal operations and information quality. According to Peters et al. (2014) however the processed information from mobile BI needs to be put to use first before it can have an impact on performance.

Information quality is a critical element of individual and business processes that rely on information for decision making. A key consideration with regards to implementing successful mobile BI is maintaining the main infrastructure comprising the data warehouse, BI Platform, data integration and data quality (Bitterer, 2011). Mobile systems and BI systems both require high information quality and this is discussed in detail in the next section.

2.4.2 Information Quality

Information is referred to as data with some meaning associated with it. Gasser, Twidale and Smith (2007, pg1721) summarize the relationship of data, information and knowledge

as follows; "*Data is a raw sequence of symbols, information is data plus the context of its interpretation and/or use, and finally knowledge is a stock of information internally consistent and relatively stable for a given community*". For a number of organizations and individuals whose business processes depend on information, the quality of information used ultimately affects the quality of decisions that are taken (Gasser et al., 2007). According to Haider and Lee Hyun (2012) Information Quality (IQ) can be taken to mean fitness for use, as users of a system ultimately judge the quality of the information produced for their consumption.

The business value of BI is derived when users access data to make decisions. It is therefore imperative that the data is of high quality. Data Quality is comprised of a set of dimensions including accuracy, completeness, consistency, relevancy and timeliness (Otto, Wende, Schmidt, & Osl, 2007). Data quality has emerged as necessary but not sufficient to achieve BI success (Isik et al., 2013). However, when organizations fail to place emphasis on the quality of data in their BI systems, the result can be undermined decisions due to flawed data (Isik et al., 2013). Data Quality Management (DQM) is referred to as quality-oriented data management and it focuses on the collection, organisation, storage and presentation of high quality data (Otto et al., 2007). Data Quality Management approaches should be utilised to ensure that fact-based, decision-making of BI remains reliable.

IOMA typically require a smart device that is connected to mobile internet or a wireless network, thus allowing users to access the necessary information via the mobile application. "*Information oriented mobile applications (IOMA) are software programs that offer users timely, personalized and localized information anytime, anywhere on mobile devices*" (Chen et al., 2012, pg128). Mobile BI applications fall into this category of an information-oriented application and would therefore require a high level of information quality to meet the requirements of the mobile BI users.

Isik et al. (2013) suggest that if BI systems are able to produce accurate, consistent and timely information to their users, then organisations are more likely to meet customer expectations as well as improve their business agility. The next section of this literature review will discuss agility and how it enables firms to remain competitive in turbulent environments.

2.4.3 Organizational Agility

The term agility is typically associated with organizations that are able to adapt and perform well in constantly changing environments. "*Agility is the degree to which a firm is able to sense and respond quickly to customer based opportunities for innovation and competitive action*" (Roberts & Grover, 2012, pg580). The environmental change which agile firms typically react to can include competitor actions, consumer preference changes, legal changes, economic swings and technological advancements (Overby, Bharadwaj, & Sambamurthy, 2006).

Agility emanates from a variety of concepts in management theory such as dynamic capability, strategic flexibility and market orientation which all relate to firms succeeding in rapidly changing environments (Chen & Siau, 2011; Overby, Bharadwaj, & Sambamurthy, 2006). Chen and Siau (2011) suggest that organizational agility is a means of creating competitive advantage and that the dynamic capability framework is able to explain how this competitive advantage is produced through timely responsiveness, flexible product innovation and management's abilities to effectively coordinate human competencies.

Overby et al. (2006) developed a framework which portrays a number of different combinations of sensing and responding capabilities that a firm may possess. In their framework there are examples of sensing capabilities such as market intelligence, government relations and research and development. Some organizations with high sensing capabilities invest deeply in CRM, for example, to improve their sensing of customer's needs and requirements (Atapattu & Sedera, 2013). In their framework, Overby et al. (2006) also identify various response types such as embarking on a new venture through product development; adjusting an existing venture by shifting production to match demand and making a calculated decision to not react to a particular environmental change.

BI can also be used as a means to sense market opportunities and threats and flexible IT infrastructure can be used to help respond to these opportunities (Chen & Siau, 2011). An attempt to describe BI agility is as follows; "*BI agility is the ability to efficiently and quickly react to changes in foreseen and unforeseen requirements based on structural and*

behavioural characteristics of the BI system as well as anticipating change proactively" (Baars & Zimmer, 2013, pg 4). According to Verkooij and Spruit (2013), mobile BI can increase organizational agility as organisations will be able to react more swiftly to market conditions from instant access to information.

Organisations that are able to understand customer demands and requirements through better sensing are also more likely to create customer satisfaction (Chan, Lam, Fang, & Brezezinski, 2004). Customer satisfaction can translate into many benefits for an organization such as increased customer loyalty and improved sales. This will be discussed further in the next section.

2.4.4 Customer Satisfaction

According to Chan et al. (2004), customer satisfaction means satisfying the needs and desires of the customer. This satisfaction in turn leads to companies generating profits. In terms of marketing belief, satisfaction is the final destination of marketing activities resulting in purchase, repeat purchase, attitude change and loyalty (Churchill & Surprenant, 1982). A number of studies have used the theory of confirmation/disconfirmation of expectations to explain customer satisfaction (Chan et al., 2004). Disconfirmation is the inconsistency between a consumer's previous expectation and actual performance (Churchill & Surprenant, 1982). According to the theory of expectation, a customer is more likely to be satisfied if actual performance confirms or exceeds their previous expectation. This is also known as positive disconfirmation. A customer is however likely to be dissatisfied if actual performance falls below their expectations and this is referred to as negative disconfirmation (Chan et al., 2004).

Higher customer satisfaction levels in a firm generally indicate "increased loyalty for current customers, reduced price elasticity, insulation of current customers from competitive efforts, lower costs of future transactions, reduced failure costs, lower costs of attracting new customers and an enhanced reputation for the firm" (Anderson, Fornell, & Lehmann, 1994, pg 55). Sun and Kim (2013) also agree on the benefits of customer loyalty pertaining to lower costs of retaining existing customers compared to spending up to five times as much time, money and resources to draw in a new customer. Sun and Kim (2013) further

suggest that customer satisfaction can be linked with the perceived quality of a company's products and services and therefore it is a key performance metric in measuring a firm's competitiveness.

Basole (2007) states, that the use of CRM solutions allows senior management and sales employees to make informed and customer-centred decisions about products and service offerings. Basole (2007) also highlights the need to make CRM solutions mobile for professionals such as sales people who spend large amounts of time away from their desks. Through mobile BI, sales employees can have instant access to crucial customer information at the point of contact which can help them maintain customer satisfaction by reducing the time to sell and providing other valuable services at the client site (Basole, 2007). Higher degrees of mobile business usage have been found to have an improved impact on the value chain offering of organisations with increases seen in marketing and sales (Picoto et al., 2012). Pulipati (2012) also suggests that mobile BI usage is able to assist highly mobile employees such as sales representatives to respond to customer requests more swiftly creating increased customer engagement and service.

This section looked at how mobile BI is able to produce benefits such as improved productivity and customer satisfaction when it is effectively integrated into existing business processes. Mobile BI is also able to create business agility when users can access accurate, consistent and timely data for their fact based decision making. The section that follows presents a conceptual model which summarises the findings and relationships obtained from the literature review.

2.5 Conceptual Model

A conceptual framework can guide research by providing a visual representation of theoretical constructs (and variables) of interest. In this research, mobile BI usage is an independent variable. The researcher intends to discover if mobile BI is able to create performance management, customer satisfaction and organizational agility. Performance management, customer satisfaction and organizational agility are thus dependent variables that are influenced by mobile BI usage. The researcher is also interested to see how

performance management, customer satisfaction and organizational agility influence strategic business value. In this part of the conceptual model performance management, customer satisfaction and organizational agility are now independent variables and strategic business value is a dependent variable.

Chapter 1 specified the objectives of this research are to investigate how mobile BI improves performance management, organizational agility and customer satisfaction and how these in turn create strategic business value. Therefore, the conceptual model in Figure 2.6 offers clarification on how mobile BI can be effectively leveraged to create strategic business value. The conceptual model was tested empirically as explained in Chapter 3.

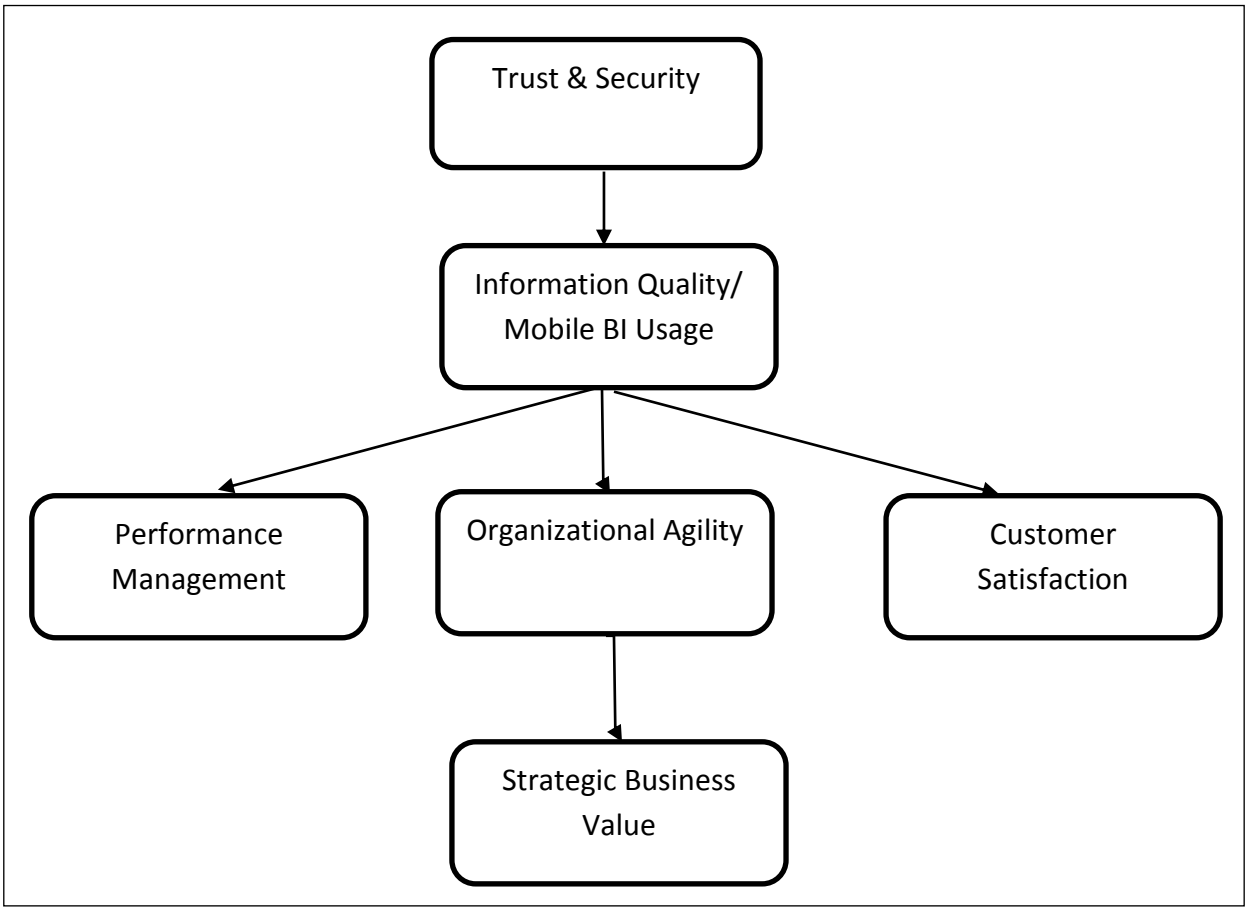


Figure 2.6: Conceptual Model

2.5.1 Definition of Constructs

The variables employed in the study are defined by conceptual definitions (constructs) that explain the concept underlying the variable. These definitions can be found below:

Trust and Security: Mobile devices pose data privacy and security concerns when it comes to mobile BI as these mobile devices can be easily lost or stolen. As such these trust and security concerns offen create a barrier for those organizations that are considering adopting mobile BI.Security is a major inhibitor to the adoption of mobile business solutions, due to concerns on how to protect mobile devices from theft, intrusion and viruses (Basole, 2007).

Mobile BI Usage (Information Quality): Mobile BI applications support employees to work independently of the corporate office at any given time. However mobile BI systems can only be trusted for decision making if the associated information quality is of a high standard. As such information quality is used as one measure of the reliability of mobile BI systems' in this study. Up-to-date information can contribute significantly towards the perceived value of mobile BI (Brockmann et al., 2012). Anywhere and anytime accessibility is another of the success factors of mobile BI user acceptance (Tapadinhas, 2012). According to Derballa and Pousttchi (2004) the ability to send and receive data anytime and anywhere using mobile devices, also known as ubiquity, is likely to result in organizational improvement.

Performance Management: Performance management is of high importance as organizations are looking internally for productivity and performance gains due to the harsh economic climate they operate in (Buchner, 2007). According to Ventana (2011), mobile BI offers employees the ability to do productive work while out on the road and this can help to improve organizational performance. Picoto et al. (2012) posit that usage of mobile business applications can result in improved internal operations and information quality.

Customer Satisfaction: Customer satisfaction means satisfying the needs and desires of the customer (Chan et al., 2004). Customer satisfaction is a key performance

metric in measuring a firm's competitiveness and higher levels of customer satisfaction are indicators of a boosted reputation for the firm (Anderson et al., 1994; Sun & Kim, 2013).Through mobile BI, sales employees can have instant access to crucial customer information at the point of contact which can help them maintain customer satisfaction levels.

Organizational Agility: The term agility is typically associated with organizations that are able to adapt and perform well in constantly changing environments. BI can also be used as a means to sense market opportunities and threats and flexible IT infrastructure can be used to help respond to these opportunities (Chen & Siau, 2011). According to Verkooij and Spruit (2013), mobile BI can increase organizational agility as organisations will be able to react more swiftly to market conditions from instant access to information.

Strategic Business Value: The business value of IT is used to describe the impacts of IT on organizational performance which can be measured in terms of productivity enhancement, profitability improvement, employee and customer satisfaction and competitive advantage (Markus & Soh, 1995; Melville et al., 2004; Scheepers & McKay, 2004). Strategic business value with BI comes from creating competitive advantage through supporting strategic objectives such as identifying opportunities and threats (Yogev et al., 2012).

2.6 Chapter Summary

The existing research on mobile BI has made efforts to understand the potential benefits of mobile BI adoption and also how to tackle mobile BI implementations (Peters et al., 2014; Tona & Carlsson, 2013; Verkooij & Spruit, 2013). These studies have also sought to understand the relationship between mobile BI usage and mobile BI success.

The literature review demonstrated that organizations which are able to incorporate mobile business more comprehensively into their value chain activities can reap higher levels of business value (Picoto et al., 2012). According to Basole (2007) there are a number of value offerings associated with adopting mobile business applications such as improved access capabilities, cost savings, improved accuracy and productivity as well as increased organisational responsiveness. Verkooij and Spruit (2013) found that mobile BI creates value it the areas of efficiency, employee satisfaction, customer satisfaction, responsiveness and competitive differentiation.

The current mobile BI business value literature is however not substantiated as the study by Verkooij and Spruit (2013) only uses a sample of seven BI experts for interviews. According to Johnson and Onwuegbuzie (2004) qualitative research such as interviews may not necessarily generalize to other settings, as the research findings may only be unique to the few participants of that particular study. The existing literature is also limited as it neglects to focus on mobile CRM and the mobile evolution which can empower employees from being bound to their physical office locations (Verkooij & Spruit, 2013). The literature is also lacking as it does not show how mobile BI affects decision making processes and organizational responsiveness (Peters et al., 2014; Tona & Carlsson 2013).

This research will therefore address the gap by providing an investigation of how mobile BI can be used to create strategic business value. The research will uncover the extent to which mobile BI enables employees to execute productive work while out on the road thus improving their individual performance. The research will also explore exactly how mobile BI can improve decision making and organizational agility by the virtue of it allowing constant access to real time data. Lastly the research will investigate how mobile BI positively impacts

customer satisfaction. Table 2.3 summarises the variables underlying the framework of this research.

Table 2.3: Definition of variables

Variable	Definition	Reference
Trust & Security	Trust and security concerns related to using BI and coporate data on mobile devices	Pulipati (2012); Trif and Visoiu (2011);Verkooij and Spruit (2013); Brockmann et al. (2012); Basole (2007); (Miller, Voas, & Hurlburt, 2012)
Mobile BI Usage/Information Quality	The information quality that mobile BI users depend on for their fact based decision making.	Brockmann et al. (2012); Chen et al. (2012);Basole (2007); Haider & Lee Hyun (2012); Chen, Meservy, & Gillenson (2012); Isik et al. (2013)
Performance Management	Employee's ability to monitor and track their performance towards achieving their goals.	Picoto et al. (2012); Buchner (2007); Lonnqvist & Pirttimaki (2006); Gruman & Saks (2011); Atkinson (2012)
Customer Satisfaction	Satisfying the needs and desires of the customer.	Picoto et al. (2012);Pulipati (2012); Basole (2007);Chan et al. (2004); Churchill & Surprenant (1982); Anderson et al. (1994); Sun & Kim (2013);Anderson et al. (1994)
Organizational Agility	Organization's ability to sense and respond to market conditions and threats swiftly.	Roberts & Grover (2012); Chen & Siau (2011); Overby et al. (2006);Chan et al. (2004); Atapattu & Sedera (2013); Verkooij & Spruit (2013); Baars & Zimmer (2013)
Strategic Business Value	Creation of a competitive advantage by supporting strategic objectives e.g. identifying opportunities and threats and improving financial performance.	Negash (2004); Picoto et al. (2012); Melville et al. (2004); Yogev et al. (2012); Derballa & Pousttchi (2004); Crossland (2010); Ramadani (2009); Markus & Soh (1995); Scheepers & McKay (2004); Elbashir, Collier, Sutton, Davern, & Leech (2013); Davenport (2006); Watson & Wixom (2007); Jones et al. (2013)

The next chapter is the research design and it describes the details of how the study was conducted. The research design describes research propositions, participants of the study, research instrument as well as the underlying philosophy of the researcher.

3 Research Design

3.1 Introduction

This chapter provides the design employed in this research. A research design describes a strategy of inquiry within the qualitative, quantitative and mixed methods approaches. It also provides direction for actions during the research process (Creswell, 2013). According to Saunders, Lewis, and Thornhill (2009) the research design is the general plan of how a researcher will go about answering their research question. It contains clear objectives from the research questions, sources from which data will be collected as well as ethical considerations.

The chapter is presented as follows: *Section 3.2* presents the research question and objectives of this study as well as the research propositions based on the literature review. *Section 3.3* outlines the philosophical assumptions that underpin this research. *Section 3.4* describes the research methodology which is made up of the research purpose, time-frame, research strategy, sampling, data collection and data analysis techniques used in this study. *Section 3.5* describes how the researcher dealt with ethical and confidentiality issues. *Section 3.6* provides a summary of the chapter.

3.2 Research Question and Propositions

The primary aim of this research was to investigate exactly how mobile BI can be leveraged to create business value and organizational performance improvements. Various factors contributing to strategic business value such as performance management, organizational agility and customer satisfaction were built into a conceptual model (see Figure 2.6).

The overall research question was as follows:

> **In what ways does mobile BI enhance an organization's performance and contribute towards strategic business value?**

3.2.1 Research Objectives

The research objectives were as follows:

- To explore how mobile BI enables an organization to be more agile through improved sensing and responding to market conditions.
- To explore the ability of mobile BI to improve employee performance management through more continuous access to actionable information.
- To explore how mobile BI can lead to improved customer satisfaction and improved responsiveness to customer requests.

3.2.2 Research Propositions

A proposition is a broad statement about the empirical world which can be established as true or false.

The following propositions were derived from the literature review, the conceptual model and the research question:

Proposition 1: The use of mobile BI has a positive impact on performance management

Proposition 2: The use of mobile BI has a positive impact on organizational agility

Proposition3: The use of mobile BI has a positive impact on customer satisfaction

Proposition 4: The effectiveness of performance management has a positive impact on strategic business value.

Proposition 5: Higher customer satisfaction levels have a positive impact on strategic business value of an organisation.

Proposition 6: Increased organizational agility has a positive impact on the strategic business value of an organization.

Proposition 7: Enhanced customer satisfaction, performance management and organizational agility all have a significant contribution towards creating strategic business value.

3.3 Research Philosophy

Research philosophy relates to the development of knowledge and the nature of that knowledge (Saunders et al., 2009). According to Guba and Lincoln (1994) the question of research methods is secondary to that of which research paradigm is employed in the research. A research paradigm is defined as "the basic belief system or worldview that guides the investigator, not only in choices of method but in ontologically and epistemologically fundamental ways" (Guba & Lincoln, 1994, pg105). It can therefore be inferred that the research philosophy chosen contains assumptions which reinforce the research strategy and methods chosen as part of that strategy.

Ontology defines a view concerning the claims of reality or the nature of being. Epistemology is described as the grounds of knowledge or the relationship between reality and the research. It deals with ways in which knowledge of reality can be gained, what can be known, how it can be known and what criteria must be fulfilled to be described as knowledge (Flowers, 2009).

The subjectivist ontology states that while individuals do not have direct access to the real world, their expression of knowledge through their observations of the world is still meaningful (Carson, Gilmore, Perry, & Gronhaug, 2001). According to Guba and Lincoln (1994) the constructivist worldview contains some central traits such as the fact that realities are local and specific. This means that reality varies between different groups of individuals. It is commonly accepted by the interpretivist researcher that the distinction between facts and value judgements will be less clear (Carson et al., 2001). This is due to the fact that the researcher will also experience that which is being studied and as a result feelings and reason will also direct the researchers' actions.

The ontological stance used in this study was objectivism which believes that "social entities exist in reality external to social actors" (Saunders, Lewis, & Thornhill, 2009, pg 110).The epistemological stance taken in this study was positivism which believes that it is possible to secure hard objective knowledge of the world (Carson et. al, 2001). Positivist studies are based on the belief that there exist real, cause and effect relationships that can be identified

and tested via propositions (Orlikowski & Baroudi, 1991). Positivists believe that truth is located out there in the real world and it waits merely to be discovered irrespective of theory or human observation.

This research was classified as positivist as it contained a conceptual framework which portrayed causal relationships showing how mobile BI is maximized to create business value. The conceptual framework displayed that mobile BI has an effect on performance management, customer satisfaction and organizational agility which all result in strategic business value. The cause and effect relationships from the literature formed the research propositions which were tested in this study.

3.4 Research Methodology

The Research methodology consists of the methods and strategies applied in gathering and analysis of data. The aim of this process is to answer the research question of this study. The next sections therefore discuss the research purpose, approach to theory, research strategy, sampling, research instrument, data collection and analysis techniques.

3.4.1 Research Purpose

The purpose of explanatory research is to develop and evaluate causal theories (Saunders et al., 2009). The aim of this research was to observe a situation or problem in order to explain the relationships of the different variables involved. The study was explanatory as it developed a causal model of direct and indirect causal links. The conceptual model derived from research literature showed that mobile BI usage affects performance management, customer service and organizational agility which result in strategic business value.

3.4.2 Approach to theory

The research approach used for this study was deductive. Deductive reasoning works from more general to specific. The approach started with a theory, which was the conceptual model in this case. The deductive approach then moved from theory to data (Saunders et al., 2009). The propositions, which were based on existing theory, were either supported or not supported based on the observation of research conducted. The study used research

methods whereby the researcher could remain a detached external observer and therefore ensured researcher independence of what was being researched. The methods used were standardized data collection and statistical analysis with STATISTICA 12.

Quantitative purists believe that a social science inquiry should be objective, and this is desirably achieved through time and context free generalizations (Johnson & Onwuegbuzie, 2004). Quantitative research was adopted in this study as it focused on deduction which tied in with the ontological stance of objectivism and the epistemological stance of positivism.

3.4.3 Research Time frame

There are two time frames which a researcher may choose to adopt either longitudinal or cross-sectional. According to Saunders et al. (2009) research is cross-sectional when it looks at the study of a particular phenomenon at a particular time. Longitudinal research on the other hand has the ability to study change and development by observing people and events over a period of time. A cross sectional time period was used for this study as it was more concerned with how the phenomena of mobile BI was manifesting itself at a given time. Cross-sectional studies often use a survey strategy to describe the incidence of a phenomenon (Saunders et al., 2009). The same can also be said of this study which used a questionnaire to investigate the phenomena of mobile BI.

3.4.4 Research Instrument

The research questionnaire was developed from the work of Chen et al. (2012), Crossland (2010) and Ramadani (2009) who investigated similar issues such as the business value of Information Technology and Business Intelligence. The research questionnaire was also based on the literature review findings presented in Chapter 2. Questions were tailored to assess the evaluation of business value that can be gained through the use of mobile BI. The

survey questions were based on the conceptual model in Figure 2.6 and the derived propositions.

The data was collected through the use of questionnaire which combined both open- and closed-ended questions and thus adopted a concurrent mixed methods approach. The questionnaire was hosted on the UCT Qualtrics survey system and an email was sent to all the required participants with the URL where they could take part in the questionnaire. The email that was sent contained a brief introduction as well as the objectives of the research. There was a low likelihood that the respondents answers would be contaminated as most employees read and respond to their own email (Saunders et al., 2009).

According to Saunders et al. (2009) internet and intranet mediated questionnaires have a 30% likely response rate within organisations. The current research was conducted primarily within Company X using the internal email distribution list for sales and presales staff thus there was a risk of receiving a 30% response rate. Edwards (2007) suggests that it is best to take a number of proactive steps such as sending pre-notification to members of an organization informing them about an upcoming survey, repeated contact with participants as well as sending reminders to participants once survey is underway. The researcher had repeated contact with the participants and sent them frequent reminders once the survey was underway.

The questionnaire itself was made up of six different Sections (as can be seen in the Appendix A) as follows:

1. Section A consists of general information about the research participants (including job title, level of education, years of experience etc.).
2. Section B provides questions on information quality which relates to the mobile BI usage of participants.
3. Section C provides questions on trust and security which address data security and privacy concerns.
4. Section D provides questions on performance management focusing on how mobile BI helps employees achieve strategic objectives.
5. Section E provides questions on how mobile creates customer satisfaction.
6. Section F provides questions on how mobile BI creates organizational agility.

7. Section G provides questions on how mobile BI contributes towards strategic business value.

Section G contained open-ended questions which allowed the respondents to express their opinions without the bias of having predefined responses to choose from.

The researcher adopted a 5-point Likert scale whose endpoints were “strongly agree” and “strongly disagree”. The Likert Scale is named after its developer Rensis Likert and it is one of the most widely used itemized scales (Malhotra, 2006). The Likert scale was adopted in this study as it was easy for the researcher to construct and administer the scale and it was also easy for the respondent to understand.

3.4.5 Sampling

Purposive sampling was adopted in this study as the researcher targeted mobile BI users such as the salespeople and executive management from various organizations. These types of respondents were required for this research as they typically spend a large amount of time away from their desks and are also users of mobile BI, and thus they could answer the question posed by the researcher. “Purposive sampling is a non-random technique that does not need underlying theories or a set number of informants” (Tongco, 2007, pg147). Although this sampling strategy is more common in qualitative research, it can also be used in quantitative research whereby the researcher selects a predetermined number of people who are judged to be the best information sources (Kumar & Phrommathed, 2005).

As the research was quantitative, the researcher targeted a predetermined number of at least 50 participants to ensure an adequate sample size for the statistical analysis. The researcher was well aware that purposive sampling could lead to distortion in findings due to bias. However it was not possible to obtain the same information richness via random sampling as the sample would not possess the necessary characteristics required for this research.

3.4.6 Research Strategy

There are two types of research methods which are often used such quantitative and qualitative research. This section will focus on quantitative research as it is the predominant method used in this research.

3.4.6.1 Quantitative Research

The survey strategy is a common strategy in business research and it is usually associated with the deductive approach. "A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (Creswell, 2013). Surveys are most frequently used to answer who, what, where, how much and how many questions (Saunders et al., 2009).The strategy of this research was a survey. The main research question used in this research was in the form of a "what" question which posed the question: "In what ways does mobile BI enhance an organization's performance and contribute towards creating strategic business value?"

The survey was the preferred method of data collection as it allowed for standardised data from a fairly large population in a highly economical way. It also allowed for easy comparison of the data collected. Surveys are also a form of data collection that most research participants are already familiar with and therefore the process is easy to understand (Saunders et al., 2009).

The researcher did not manipulate any behaviour in this research as they wanted to observe the current manifestation of mobile BI and the researcher believed in staying independent of the research. Consequently the survey strategy was relevant to investigate how mobile BI creates business value in this study. The findings of the survey were also compared with the previous findings from the research literature in order to confirm or reject the research propositions concerning the ways mobile BI creates business value.

3.4.7 Data Collection

According to Saunders et.al (2009) a researcher has several choices when selecting research methods such as using a single data collection technique and corresponding analysis called mono method, or to use a combination of data collection techniques and analysis methods called multiple method. Mixed methods combine both quantitative and qualitative data collection techniques and analysis in a research design (Saunders et. al, 2009).

While the present study was orientated to the positivist paradigm and it used quantitative data as its main form of data collection, there was still a need for qualitative data in this research. According to Johnson and Onwuegbuzie (2004) qualitative research is characterized by induction, exploration, discovery and qualitative data analysis. Qualitative research methods are typically used to uncover and understand phenomena which are still emerging (Creswell, 2013). In this regard mixed method research was able to add insight and understanding that may not be obtained by merely using a single method (Migiro & Magangi, 2011).

The use of mixed methods in this research was for completeness of the study whereby qualitative data was used to fill gaps of quantitative data collection and also as a means of triangulation to validate the research findings (Saunders et. al, 2009). The researcher acknowledges that mixed method research has limitations of the researcher needing to learn and understand multiple methods and it is more expensive and time consuming than a single method (Migiro & Magangi, 2011). The researcher minimised these weaknesses by building in the necessary time allowance to conduct the necessary analysis for both methods.

3.4.7.1 Quantitative Data Collection

The researcher first sought permission to conduct research at company X which is a global ERP vendor who also uses mobile BI internally. This process involved liaising with senior management of Company X. As part of this process the researcher also had to sign a Non-Disclosure Agreement drafted by the legal department of company X to protect the privacy of the information that was collected from their organization. The questionnaire was sent

out to 290 employees of Company X. The questionnaire was sent out to senior management, sales and presales staff of Company X.

The researcher however received an insufficient response rate from Company X and thus sought additional responses from mobile BI users in various organizations, as well as using mobile BI groups on social forums such as LinkedIn and the SAP community network. The researcher used online mobile BI groups which had moderators who controlled access rights into the group and therefore maintained the integrity of the groups. In the end the researcher obtained 105 responses of which 55 were complete and usable; the study therefore had a 31% response rate. Table 3.1 presents a profile of the respondents:

Table 3.1: Profile of Respondents

	Frequency	
Category	No	%
Staff Role		
Presales/Sales Staff	21	38
First Level Supervisor	7	13
Middle Management	24	44
Top Management	3	5

According to Saunders et al. (2009) statistical analyses usually require a minimum sample size of 30, as this results in a sampling distribution for the mean that is very close to a normal distribution. In addition Saunders et al. (2009) highlight that samples of larger absolute size are more likely to be representative of the population. Therefore the sample size of 55 for this present study may be considered acceptable for the quantitative analysis that was performed in this research.

3.4.7.2 Qualitative Data Collection

Qualitative data was obtained from Section G (Strategic Business Value) of the questionnaire via open ended questions. This section consisted of 3 questions about the role mobile BI plays in protecting the organizations revenues and competitiveness, organizational performance and also how the organization can improve the value it gains from its investment in mobile BI. Mobile BI users completed this section and the data was captured in the Qualtrics survey tool prior to data analysis.

3.4.8 Pretesting of Questionnaires

The questionnaire used in this study was pretested in order to assess the reliability and validity of the constructs. The purpose of the pilot study was to ensure that the online questionnaire was understandable and it allowed the researcher to conduct a preliminary analysis of the pilot test data to ensure investigative questions could be answered (Saunders et al., 2009).

The pilot study was conducted with a sample of five participants who were highly knowledgeable about mobile BI and were selected via purposive sampling. Saunders et al. (2009) recommends a minimum number of 10 respondents for the pilot however since the researcher was still negotiating access with the main organisation participating in the study, a smaller pilot group was used.

The researcher asked the test participants for additional information on their views regarding the questionnaire. This was achieved by asking the following open-ended questions:

- How long the questionnaire took to complete
- The clarity of the questions
- Which, if any, question were unclear or ambiguous
- Which, if any, questions the respondent felt uneasy about answering
- Whether in their opinion there were any major topic omissions
- Whether the layout was clear and attractive
- Any other comments

(Saunders et al., 2009).

Necessary minor adjustments were made before the questionnaire was administered to the final sample group.

3.4.9 Assessing validity

According to Saunders et al. (2009, pg 372) internal validity refers to "the ability of a questionnaire to measure what it is intended to measure". The internal validity of the questionnaire can be seen in content validity, criterion validity and construct validity. Content validity measures how well the questionnaire covers the research questions and objectives. The researcher ensured the content validity of the questionnaire by carefully reviewing literature relating to BI in general as well as mobile BI literature. The researcher also ensured content validity through discussing the questionnaire with BI experts and also through feedback received from the pilot phase of the questionnaire. This feedback helped the researcher decide as to whether any adjustments were needed on the questionnaire. Construct validity refers to how well the questionnaire measures the constructs intended for it to measure.

Face validity determines whether the questionnaire appears to make sense (Saunders et al., 2009). The pilot test results showed the researcher that research participants found the questionnaire easy to understand.

3.4.10 Quantitative data analysis

The research followed two methods of quantitative analysis for the numeric data. The first method was descriptive analysis which refers to statistically describing and consolidating the constructs being studied and their associations (Bhattacherjee, 2012). The second method was inferential analysis which refers to the statistical testing of propositions. Both of these methods were used by the researcher to test the propositions concerning mobile BI being able to create business value. The Qualtrics software which the researcher used to administer the survey automatically coded the responses into an Excel spread sheet that was readable by the STATISTICA 12 package. Each response was given a unique ID number which was recorded in the rows of the spread sheet and the questions asked were recorded in the columns.

The following descriptive statistics were used; frequency distribution, central tendency (mean, median, mode) and dispersion (Bhattacherjee, 2012). Cronbach Alpha was used to measure reliability of constructs with alphas below 0.7 being regarded as poor in this study. Factor analysis is a data reduction technique that is used to aggregate large numbers of observed items into smaller sets of unobserved factors in order to assess the validity of the items (Bhattacherjee, 2012). Factor analysis was conducted to test the validity of the items making up the relevant constructs, for example those items making up organizational agility. The researcher tested for variables with factor loadings of greater than 0.5.

Significance testing was conducted using a test statistic and degrees of freedom, to show if test results occurred by chance alone. This was measured by the probability (p-value) of 5% or less and is referred to as rejecting the null hypothesis in hypothesis testing (Saunders et al., 2009). A correlation coefficient was used to quantify the strength of the linear relationships between two variables in the study such as performance management and strategic business value. The correlation coefficient can take values from +1 showing positive correlation or -1 for negative correlation, however correlation does not prove causality. Linear regression was then used in the analysis to test the effect of the independent variables such as performance management on the dependent variable of strategic business value.

3.4.11 Thematic Analysis

The researcher used deductive thematic analysis for the open ended questions in the questionnaire. “Thematic analysis is a qualitative analytic method for identifying, analysing, and reporting patterns (themes) within data” (Braun & Clarke, 2006, pg 79).The researcher used the deductive a priori template of codes approach (see Appendix D) based on the research question, survey questions and conceptual framework of this study. According to Fereday and Muir-cochrane(2006) the researcher develops a code book before commencing in depth analysis of the data, a template can then be used to organize text for later interpretation based on these codes.

3.5 Ethics and Confidentiality

Research ethics refers to the fact that the proposed research design must be both methodologically sound and morally defensible (Saunders et al., 2009). The researcher attempted to conduct the research by following the university's ethical guidelines. The research was conducted in a number of places including a large group of employees from Company X. The researcher applied for approval to conduct the research within Company X via the necessary channels. The researcher established contact with the presales manager who advised how to apply for approval within this organisation and also negotiated access with the main mobile BI user groups of presales, sales and executive management.

Organisational concerns that a researcher may face can be placed in one of the three following categories:

- Concern about the amount of time or resources that may be involved in the request for access.
- Sensitivity of the topic
- Confidentiality of the data and anonymity of organisation or individual participants (Saunders et al., 2009)

BI is considered to be a strategic differentiator that enhances the competitive advantage of an organization and therefore there is a need to ensure the confidentiality of the participants of this mobile BI research. A questionnaire was used to collect data for this research and it was regarded as less time consuming way to access research participants than conducting interviews. A sample of the questionnaire that was used in this study was sent to UCT Ethics committee along with the Research Design and Ethics application form (see Appendix B). The UCT Ethic committee granted the researcher permission to proceed with the research. An invitation for participation in the study was sent to the research participants (see Appendix C). This letter communicated the aims of the research to the potential participants.

The participants were also informed that they are not obliged to participate in the research and that any involvement was completely voluntary and would also remain anonymous. Participants were also informed that a summary of findings could be made available to them after the final thesis had been marked. The participants were assured that no private company or individual information would be divulged.

3.6 Chapter Summary

This chapter provided an overview of the design used in this research process. The primary aim of this research was to investigate exactly how mobile BI can be utilized to generate business value and organizational performance improvements. Table 3.2 outlines a summary of the research methodology followed. The researcher obtained 55 complete questionnaires from mobile BI users within industry which were used in subsequent analysis. Data analysis was conducted to get a feel of the data, test the reliability and validity of the measures and also test the research propositions. The next chapter explains the various quantitative and qualitative analysis techniques that were conducted by the researcher.

Table 3.2: Research Methodology Summary

METHODOLOGY	APPROACH
Underlying philosophy	Positivist
Research purpose	Explanatory
Reasoning approach	Deductive
Research strategy	Mixed approach (Quantitative & Qualitative) Survey
Data collection techniques	Quantitative and Qualitative • open and closed questions
Data Analysis	Quantitative • Statistical analysis software (Statistica 12) and Microsoft Excel 2010. Qualitative • Deductive thematic analysis and Microsoft Excel 2010
Time-frame	Cross-sectional

4 Analysis

4.1 Introduction

The objective of this research as indicated in Chapter 1 was to investigate the role that Mobile BI plays in enhancing an organization's performance as well as how it creates business value. In order to answer this question, research propositions were created based on the literature review. After which the research was designed to collect data from mobile BI users within organizational settings. Statistical techniques were used to describe and consolidate the data being studied as well as to assess the reliability of measurement scales. Statistical techniques were also used to perform inferential analysis which refers to the statistical testing of propositions.

The chapter is presented as follows: *Section 4.2* presents the demographic data collected by the surveys which shows the background of the participants. *Section 4.3* provides a sound indication of how participants reacted to individual items in the questionnaire. *Section 4.4* presents the factor analysis which tests the validity of the questionnaire whilst *Section 4.5* describes the Cronbach Alpha test related to the reliability of the questionnaire. *Section 4.6* refers to the correlation analysis which examines the association of the variables and regression analysis which tests for causality. *Section 4.7* analyses the qualitative data that was collected via open ended questions. *Section 4.8* provides a summary of the chapter.

4.2 Demographic Data

Participants of this research answered demographic questions in the survey related to their full time working experience, job title and highest level of education as well as use of personal mobile devices for work purposes. The participants also indicated the type of smart device they used to access mobile BI. The options provided for this question were either a smartphone, tablet device or both. Lastly the participants were asked to indicate the level of mobility associated with their job based on the amount of time spent away from their desks.

4.2.1 Number of years of experience

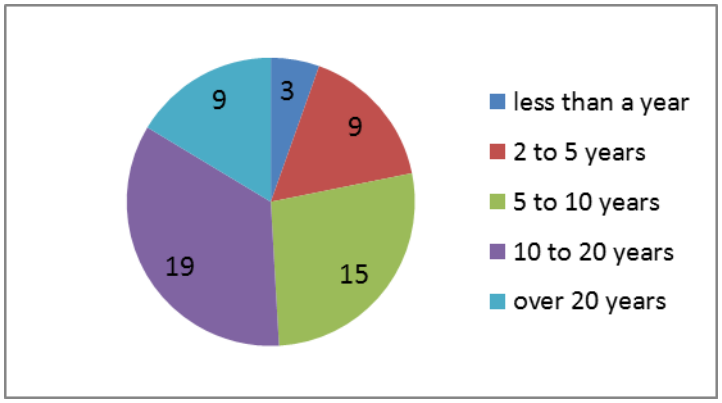


Figure 4.1: Number of Years Working experience

Figure 4.1 shows the five groups of work experience relating to the 55 mobile BI users that took part in the survey. Three participants had less than one year of full time working experience and almost a fifth of participants had over 20 years work experience. The distribution of years of working experience is skewed as it contains 75% of participants having more than five years working experience. This shows that the participants in the study had been sufficiently exposed to the business environment.

4.2.2 Job Title

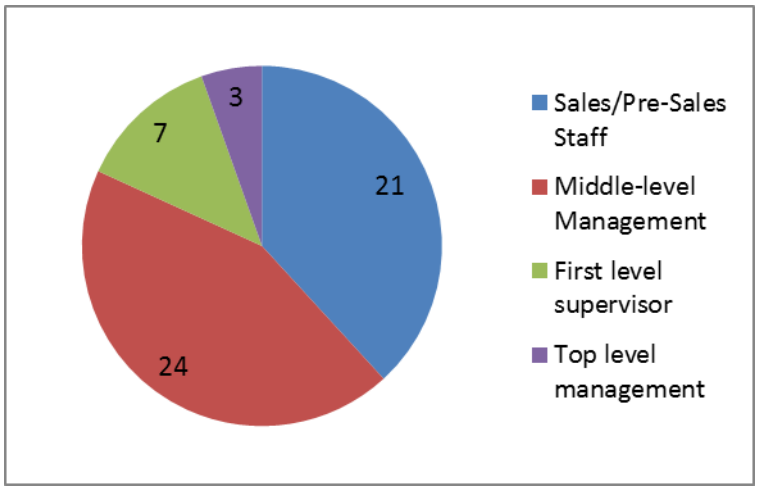


Figure 4.2: Job Title

Figure 4.2 shows that of the 55 mobile BI users that participated in the survey, 24 were middle management and 21 were Sales or Presales staff (the latter being skilled IT professionals). Top level management was the least occurring role with only 3 participants followed by first level supervisor with 7 participants. As a result the job titles typically associated with high levels of mobility accounted for 44% of the sample.

4.2.3 Highest Level of education

Figure 4.3 shows that of the 55 mobile BI users that participated in the survey, 25 participants held Bachelor's degrees and 17 had a Master's degree. Five of the participants held a higher diploma and there were four participants who had either an Honours degree or Professional certificate as their highest level of education.

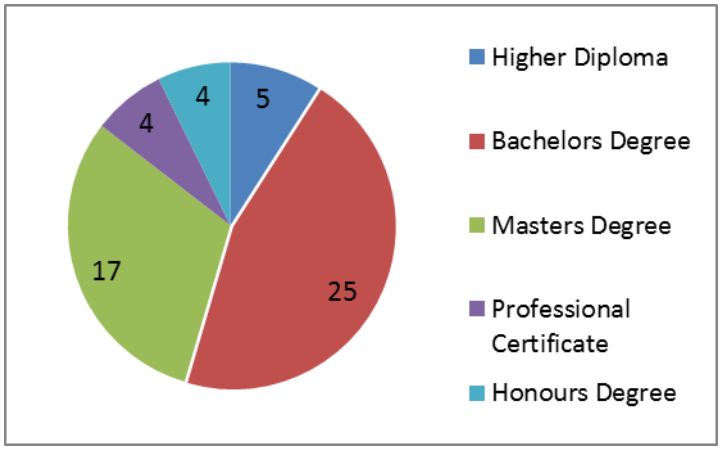


Figure 4.3: Highest level of education

4.2.4 Type of smart device used

Figure 4.4 shows that of the 55 mobile BI users taking part in the survey, 30 participants used a smartphone to access mobile BI, 19 participants used a tablet and six participants used both. 54% of the participants accessed mobile BI via smartphones and this may impact their perceptions of mobile BI due to using smaller screens to access vital information.

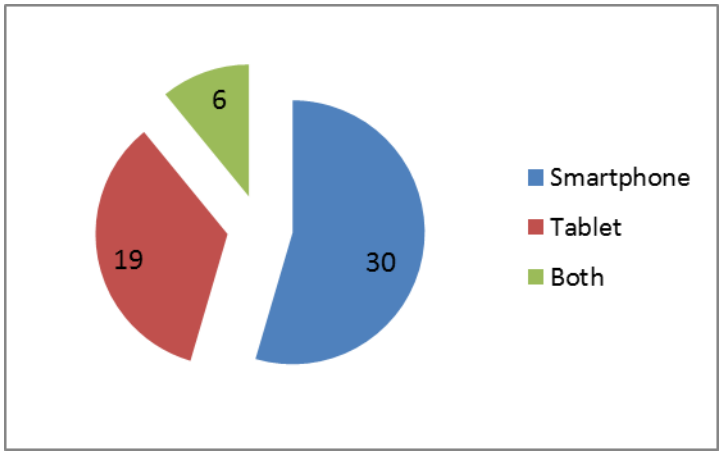


Figure 4.4: Type of smart device used

4.2.5 Percentage of time spent away from desk

From Figure 4.5 it can be seen that 28 participants spent 25% to 50% of time away from their desks. There were 13 participants that spent 50% to 75% of time away from their desks as well as 13 participants that spent less than 25% of time at their desks. On the whole the sample was comprised of individuals with high levels of mobility as three quarters of mobile BI users spent at least 25% of their time away from their desks. The results show that one of the participants was extremely mobile spending 75% of their time away from their desk.

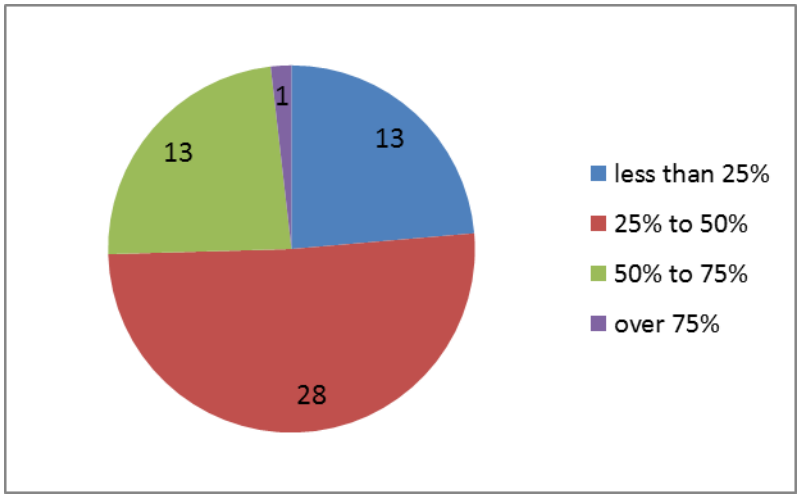


Figure 4.5: Percentage time spent away from desk

4.3 Analysis of Responses

Descriptive statistics were used to review and describe the data collected. This stage involved the analysis of the characteristics of the research participants, and responses to individual items and variables. The mean, range and standard deviation of the data provided a sound indication of how participants reacted to individual items in the questionnaire. According to Cavana, Delahaye and Sekara (2001) the range or spread of responses to each individual items in the scale can be used to detect bias. This is primarily evident if respondents only stick to certain points on the scale. A normal distribution curve can be used to determine the probability that the sample came from a normally distributed population. The skewness and kurtosis of a normal distribution both have a value of 0. The values for both kurtosis and skewness in the research indicate that the responses were not normally distributed.

Appendix E provides a summary of the items measuring mobile BI business Value. A frequency distribution of the variables is shown in Table 1. The central tendency, variability and shape of the distributions are shown in Table 2. The sample size (N) in both tables shows that there were no missing values. As indicated in Table 1 (Appendix E), none of the questionnaire items had means below average (i.e., 3.5) for the five point Likert scales which were used. This suggests that, in general, respondents agreed with the opinions expressed by the items. The ranges and standard deviations show that the data was somewhat spread around the mean. Information accessibility (IQ4) showed the least deviation from the mean with a standard deviation of 0.68 whilst ORG5 showed the most deviation with a standard deviation of 0.99. 73% of mobile BI users also agreed that their organization was equipped to produce better products and services through applying customer information gained from mobile BI (ORG5).

4.3.1 Mobile BI Usage

90% of mobile BI users agreed that mobile BI allows them to access information from any location at any given time (IQ1) and also that it provides up to date BI related information

(IQ4). 73% of the users also agreed that the information provided by mobile BI was at the right level of detail (IQ2) in addition 84% of the users felt the information was easy to understand relative to the tasks they need to complete (IQ3).

4.3.2 Performance Management

Over 80% of mobile BI users agreed that mobile BI provides them key performance indicators to drive better decision making (PEM4) and it also helps with communicating corporate and financial performance information more effectively (PEM3). 63% of mobile BI users agreed that mobile BI assists with the process of identifying and managing risks to employee objectives (PEM6) and also that it enables employees to be clearer about their contribution towards strategic objectives (PEM5).

Mobile BI users were asked to rank mobile BI and analytics features according to importance when completing operational tasks (PEM1). Metrics and key performance indicators were the most highly ranked feature followed by data access to live data sources. Ad hoc querying and reporting was the least prioritized feature. Mobile BI users were also asked to select the most prevalent BI functionality offered from the options of dashboards, data visualisation, alerts and advanced analytics (PEM2). As can be seen from Figure 4.6, dashboards were the most popular function with advanced analytics being the least favoured BI functionality. Both dashboards and performance metrics were prominent features showing how mobile BI assists with efficiency and performance management.

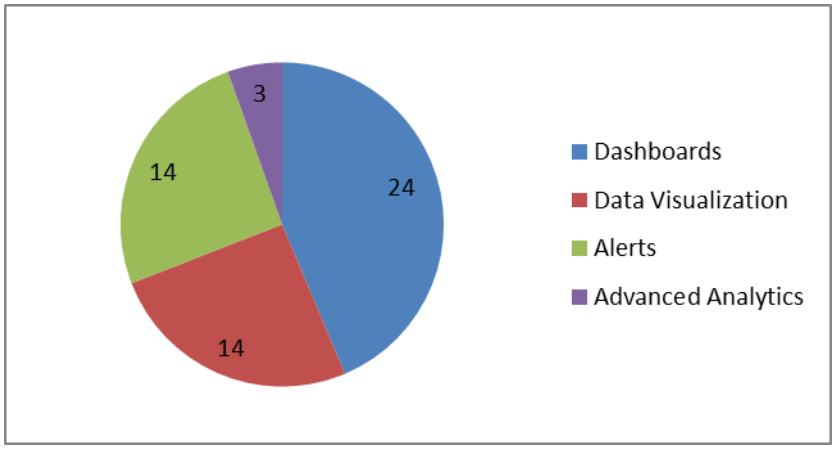


Figure 4.6: Mobile BI functionality prevalent on mobile devices

4.3.3 Organizational Agility

80% of mobile BI users agreed that mobile BI enabled their organization to respond to customer requirements (ORG3) as well as to threats and market opportunities more effectively (ORG4). 73% of mobile BI users also agreed that their organization was equipped to produce better products and services through applying customer information gained from mobile BI (ORG5).

4.3.4 Customer Satisfaction

84% of mobile BI users agreed that mobile BI enables customer service innovation (CUS2). 80% of mobile BI users agreed that mobile BI enabled more effective customer interactions (CUS4) and that it also improved convenience to customers through self service (CUS1). 71% of the mobile BI users also agreed that mobile BI reduced the time needed to sell products and provide other valuable services to customers (CUS3).

4.3.5 Strategic Business Value

75% of mobile BI users agreed that mobile BI had a positive impact on sales and revenues through customer innovation (SBV3) and that it also helped the organization to improve agility (SBV4). 72% of mobile BI users agreed that mobile BI improves efficiency and coordination of operations and business processes (SBV1). Only 65% of mobile BI users agreed that mobile BI improves customer satisfaction ratings through improved collaboration with clients (SBV2).

4.4 Factor Analysis

Factor analysis is an interdependency technique for identifying groups or clusters of variables. It is used to reduce a data set from a group of interrelated variables into a smaller set of factors, without designating some as variables as dependent and others as independent variables (Blumberg, Cooper, & Schindler, 2008; Field, 2009). Bhattacherjee

(2012, pg135) offers the following definition, "*Factor analysis is a data reduction technique that is used to statistically aggregate a large number of observed items into a smaller set of unobserved variables called factors based on underlying bivariate correlation patterns*". Bivariate correlation is a correlation between two variables and Field (2009) suggests that the first step when conducting a factor analysis is to look at the inter-correlation between variables as the correlation may either be too high or too low.

Factor analysis is commonly used to demonstrate convergent and discriminant validity. Convergent validity is the closeness by which a measure is related to the construct that it is intended to measure whereas discriminant validity measures the inverse and thus how dissimilar the measures are from other constructs (Bhattacherjee, 2012).

According to Field (2009) factor analysis has a number of uses such as to understand the structure of a set of variables and constructing a questionnaire to measure an underlying variable (Field, 2009). In this study factor analysis was used to demonstrate convergent validity as well as to understand the structure of the various constructs of the conceptual model. It is however important to note that factor analysis is purely exploratory and that the interpretation of factor loadings is highly subjective (Blumberg et al., 2008; Field, 2009).

The researcher used the Principal Components method of extraction to perform factor analysis within Statistica12. Principal Component analysis is a psychometrically rigorous procedure which deals with establishing the linear components which exist within data (Field, 2009). When conducting factor extraction, only factors that are statistically important, and therefore have large eigenvalues, should be retained. An eigenvalue is the sum of the variances of the factor value, and when it is divided by the total number of variables it estimates the total variance explained by a factor. Field (2009) recommends retaining all factors with eigenvalues greater than 1 as an eigenvalue of 1 represents a substantial amount of variation (Blumberg et al., 2008). As can be seen in Table 4.1 the eigenvalues of the factors extracted by the principle components method in this study are all above 1 and thus all factors found can be retained.

Table 4.1: Eigenvalues of Principal Components

Value	Eigenvalues (FinalSample) Extraction: Principal components			
	Eigenvalue	% Total (variance)	Cumulative (Eigenvalue)	Cumulative (%)
1	8.49	40.43	8.49	40.43
2	2.31	11.01	10.80	51.44
3	1.68	7.98	12.48	59.42
4	1.21	5. 78	13.69	65.19
5	1.16	5.51	14.85	70.70

Table 4.2 shows the factor loadings of all the variables that were employed in the questionnaire. A loading of 0.5 was used as a cut-off point due to the small sample size used in this study. The variables grouped into five factors corresponding with the five constructs found in the conceptual model. The five factors are described as follows:

4.4.1 Factor 1 (Organizational Agility)

ORG3- Respond to customer requirements

ORG4- React faster to threats or opportunities in the market

ORG5- Producing better products and services

Organizational agility was the construct underlying factor 1. It emerged as the prime factor and accounted for 40% of the total variance. The ORG1 and ORG2 variables of organizational agility were removed from the factor analysis as they loaded onto incorrect factors. Organizational agility consists of three variables: ORG3, ORG4 and ORG5. The factor loadings of ORG3 (0.80) and ORG4 (0.84) are very high suggesting they have more influence on the factor than the ability to produce better products and services through mobile BI (0.58). As reported in literature the definition of agility refers to the ability of organizations to sense and respond quickly to opportunities. It may be concluded that mobile BI users acknowledge the importance of these items. In section 4.3 most respondents agreed with these three variables and how they helped to create mobile BI business value. The participants however agreed to lesser extent with ORG5.

4.4.2 Factor 2 (Mobile BI Usage)

IQ1 - Access information from any location

IQ2 - Information at right level of detail

IQ3 - Information related to tasks is easy to understand

IQ4 – Up to date information

Mobile BI Usage was the construct underlying factor 2. It emerged as the second most important factor and accounted for 11% of the total variance. Mobile BI Usage consists of four variables: IQ1, IQ2, IQ3 and IQ4. The factor loadings of IQ2 (0.83) and IQ3 (0.77) are very high suggesting they have more influence on the factor than accessing information from any location (0.69) and up to date information (0.71). As reported in literature the vital characteristic of high information quality for mobile BI is the ability to receive information at the right level of detail. In section 4.3 most respondents agreed with these four variables. It may be concluded that mobile BI users acknowledge the importance of these items. The responses however show that the mobile BI users agreed more with IQ3 than IQ2.

4.4.3 Factor 3 (Performance Management)

PEM3 - Reporting corporate and financial performance information

PEM4 – Delivers Key Performance Indicators appropriately

PEM5 - Enables clarity about meeting strategic objectives.

PEM6 - Identifying and managing risks to employee objectives.

Performance management was the construct underlying factor 3. It emerged as the third most important and accounted for 8% of the total variance. PEM1 and PEM2 were not included in the factor analysis as these questions were not measured on a five point Likert scale like the rest of the questions relating to this construct. Information quality consists of four variables: PEM3, PEM4, PEM5 and PEM6. The factor loadings of PEM5 (0.78) and PEM4 (0.76) are very high suggesting they have more influence on the factor than reporting corporate performance information (0.71) and identifying and managing risks to employee

objectives (0.75). As reported in literature performance management requires performance monitoring to ensure an organization is able to meet its goals. In section 4.3 most respondents agreed with these four variables. It may be concluded that mobile BI users acknowledge the importance of these items. The responses show that the mobile BI users agreed with PEM4 the most.

4.4.4 Factor 4 (Customer Satisfaction)

CUS1 - Improved customer convenience through customer self-service.

CUS2 - Customer service innovation.

CUS3 – Reduce time needed to sell products and services.

CUS4 – Enables more effective customer interactions.

Customer satisfaction was the construct underlying factor 4. It emerged as second least important factor and accounted for 5.78% of the total variance. Customer satisfaction consists of four variables: CUS1, CUS2, CUS3 and CUS4. The factor loadings of CUS1 (0.76) and CUS4 (0.72) are very high suggesting they have more influence on the factor than customer service innovation (0.59) and reducing time needed to sell products and services (0.65). As reported in literature customer satisfaction means satisfying the needs of customers and this can be through improving convenience and effectiveness of customer interactions. In section 4.3 most respondents agreed with these four variables. It may be concluded that mobile BI users acknowledge the importance of these items.

4.4.5 Factor 5 (Strategic Business Value)

SBV1 – More efficiency and coordination in operations and business processes

SBV2 – Improved collaboration with clients leading to faster customer care service

SBV3 – Positively impacts sales and revenues

SBV4 – Assists organization to be more agile and focused on continuous learning

Strategic business value was the construct underlying factor 5. It emerged as the least important factor and accounted for 5.51% of the total variance. Strategic business value consists of four variables: SBV1, SBV2, SBV3 and SBV4. The factor loadings of SBV3 (0.71)

and SBV1 (0.65) are very high suggesting they have more influence on the factor than improved collaboration with clients (0.61) and assisting the organization to be more agile and focused on continuous learning (0.59). As reported in literature business value encompasses productivity enhancement, profitability improvement, customer satisfaction and competitive advantage. In section 4.3 most respondents agreed with these four variables. The mobile BI users agreed with SBV3 the most. It may be concluded that mobile BI users acknowledge the importance of these items.

Table 4.2: Factor Loadings on constructs of Mobile BI Business Value

Variable	Factor Loadings (Varimax raw) (FinalSample) Extraction: Principal components (Marked loadings are >.500000)				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
IQ1		0.698700			
IQ2		0.832377			
IQ3		0.773251			
IQ4		0.710354			
PEM3			0.719965		
PEM4			0.760814		
PEM5			0.780521		
PEM6			0.755495		
ORG3	0.806019				
ORG4	0.843925				
ORG5	0.586819				
CUS1				0.760255	
CUS2				0.596796	
CUS3				0.656938	
CUS4				0.720738	
SBV1					0.652649
SBV2					0.611302
SBV3					0.715412
SBV4					0.586824

4.5 Reliability of the Instrument

Reliability relates to the degree to which data collection techniques or analysis procedures actually yield consistent and dependable results (Bhattacherjee, 2012; Field, 2009; Saunders et al., 2009). This means that if the same scale is used to measure a construct several times,

then we can expect the same result each time. Cronbach alpha is the most common measure of reliability and it works by roughly splitting data in half in every possible way and calculating the correlation coefficient for each half (Field, 2009). Values between 0.7 and 0.8 for Cronbach alpha are usually deemed as acceptable whilst values below 0.7 indicate an unreliable scale. Field (2009) however suggests using these guidelines with caution as the value of alpha increases in relation to the number of items used in the scale, and thus it is possible to obtain a high alpha that may not be linked to high reliability of the scale. This view is shared by Bhattacherjee (2012) who suggests that consistency does not mean accuracy or validity of the construct.

The results in Table 4.3 showed that all except two of the constructs measured met the criteria of an alpha with a value above 0.7 which is the threshold. The Cronbach alpha scores of the reliable constructs were as follows; mobile BI usage with 0.82, organizational agility with 0.73, customer satisfaction with 0.84 and strategic business value with 0.81. The performance management construct had a score of 0.69 despite having five items measuring this construct. Due to the alpha of this construct being only slightly below the accepted threshold, the researcher decided to retain this construct for further analysis. The trust and security construct however was removed from further analysis as the scale to measure trust could not be regarded as dependable due to the low alpha score of 0.61.

Table 4.3: Reliability Scores

Variable	**No. of items**	**Cronbach Alpha**
Mobile BI Usage	4	0.82
Performance Management	5	0.69
Organizational Agility	5	0.73
Customer Satisfaction	4	0.84
Strategic Business Value	4	0.81
Trust & Security	4	0.61

4.6 Regression and Correlation Analysis

4.6.1 Correlation Analysis

Spearman Rank correlation coefficient is a non-parametric statistic that can be used when data is not normally distributed (Field, 2009) Spearman Rank works by first ranking the data and then applying Pearson's equation to the ranks. A lot of care must be taken when interpreting correlation coefficients as correlation does not prove causality this is due to other possible unmeasured variables that may affect the results (Field, 2009). Also the correlation coefficient does not specify in which direction causality operates.

According to Cavana, Delahaye and Sekara (2001) the correlation matrix gives an indication of how closely related or unrelated two particular variables actually are. Saunders et al. (2009) state that high correlation coefficients of generally 0.9 and above indicate multicollinearity which make it difficult to determine effects of individual variables. Cavana et al. (2001) further caution the use of variables with correlation scores over 0.75 as those variables may be measuring the same concept. A correlation analysis was conducted for the various combinations of the dependent and independent variables of this study, as shown in Appendix F. It can be seen from the correlation results that none of the correlation scores of the variables were above 0.75, and therefore there was no multicollinearity of variables.

4.6.2 Regression Analysis

According to Field (2009) regression analysis is a way of predicting an outcome variable from a predictor variable (simple regression) or several predictor variables (multiple regression). Multiple regression is a descriptive tool with a number of uses such as to develop an estimating equation to predict dependent variables from independent variables and to test and explain causal theories (Blumberg et al., 2008).

According to Field (2009) the sample size required for regression analysis depends on the size of the effect, which means how well the predictor or independent variables of the model predict the desired outcome. As shown in Figure 4.7, the author suggests that a

sample size of 50 is required when there are six independent variables in a model and a large effect is desired. Field (2009) also suggests that a researcher should have at least 10 participants per variable. The present study had 55 participants and five variables therefore meeting the criteria of number of participants per variable.

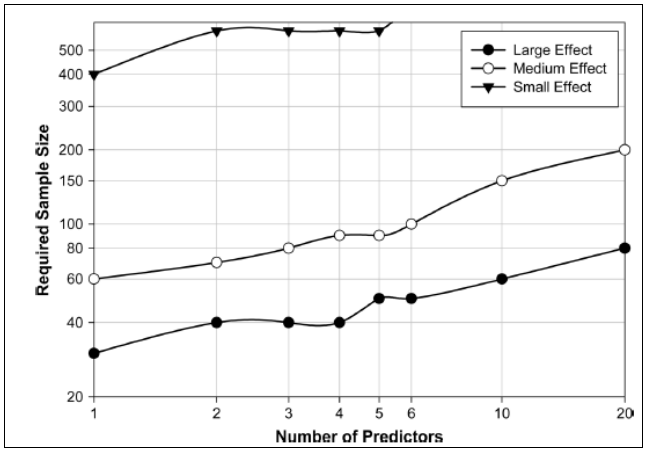


Figure 4.7: Sample size required for Regression testing based on effect desired

In this particular study multiple linear regression was used as an inference tool to test the research propositions proposed by the researcher. The correlation coefficient squared also known as the coefficient of determination or R^2 was used to show the amount of variation in one variable explained by another variable (Field, 2009; Saunders et al., 2009). According to Saunders et al. (2009) if all the variation in the dependant variable can be explained by the independent variable then the coefficient of determination would have a value of 1.

4.6.2.1 Effect of mobile BI usage on customer satisfaction

The relationship between the independent variable mobile BI usage (IQ) and the dependent variable customer satisfaction (CUS) can be seen in Table 4.4 below:

Table 4.4: Effect of mobile BI usage on customer satisfaction

N=55	Regression Summary for Dependent Variable: CUSAV (FinalSample) R= .36764356 R^2= .13516179 Adjusted R^2= .11884408 F(1,53)=8.2831 p<.00576 Std.Error of estimate: .67726					
	b*	Std.Err. (of b*)	b	Std.Err. (of b)	t(53)	p-value
Intercept			2.50	0.57	4.35	0.00
IQAV	0.37	0.13	0.40	0.14	2.88	0.01

The p-value of the IQ variable is 0.01 and therefore this relationship is statistically significant as it has p-value less than 0.05. Mobile BI usage is found to be a significant predictor of customer satisfaction. Mobile BI usage has a Beta value of 0.40 and it also has a positive relationship with customer satisfaction, meaning when mobile BI usage increases so does customer satisfaction. Mobile BI usage can account for approximately 14% of the variation in customer satisfaction (R^2=0.14).

4.6.2.2Effect of mobile BI usage on performance management

The relationship between the independent variable mobile BI usage (IQ) and the dependent variable performance management (PEM) can be seen in Table 4.5 below:

Table 4.5: Effect of mobile BI usage on performance management

N=55	Regression Summary for Dependent Variable: PEMAV (FinalSample) R= .31917379 R^2= .10187191 Adjusted R^2= .08492610 F(1,53)=6.0116 p<.01754 Std.Error of estimate: .67619					
	b*	Std.Err. (of b*)	b	Std.Err. (of b)	t(53)	p-value
Intercept			2.60	0.57	4.53	0.00
IQAV	0.32	0.13	0.34	0.14	2.45	0.02

Mobile BI usage has a statistically significant relationship with performance management and it has a p-value of 0.02. Mobile BI usage has a Beta of 0.34 and it has a positive relationship with performance management, meaning when mobile BI usage increases so does performance management. Mobile BI usage can account for approximately 10% of the variation in performance management (R^2=0.10).

4.6.2.3Effect of mobile BI usage on organizational agility

The relationship between the independent variable mobile BI usage (IQ) and the dependent variable organizational agility (ORG) can be seen in Table 4.6 below:

Table 4.6: Effect of mobile BI usage on organizational agility

N=55	Regression Summary for Dependent Variable: ORGAV (FinalSample) R= .33674170 R²= .11339497 Adjusted R²= .09666657 F(1,53)=6.7786 p<.01194 Std.Error of estimate: .80602					
	b*	Std.Err. (of b*)	b	Std.Err. (of b)	t(53)	p-value
Intercept			2.19	0.68	3.21	0.00
IQAV	0.34	0.13	0.43	0.17	2.60	0.01

Mobile BI usage is a significant predictor of organizational agility and its p-value is statistically significant at 0.01. Mobile BI usage can account for approximately 11% of the variation in organizational agility (R^2=0.11). Mobile BI usage was found to have a positive relationship with organizational agility meaning when mobile BI usage increases organizational agility increases likewise.

4.6.2.4Effect of customer satisfaction, performance management and organizational agility on strategic business value

Table 4.7 shows the effect of the independent variables customer satisfaction (CUS), performance management (PEM) and organizational agility (ORG) on strategic business value (SBV).

Table 4.7: Effect of customer satisfaction, performance management and organizational agility on strategic business value

N=55	Regression Summary for Dependent Variable: SBVAV (FinalSample) R= .70332677 R²= .49466855 Adjusted R²= .46494317 F(3,51)=16.641 p<.00000 Std.Error of estimate: .52604					
	b*	Std.Err. (of b*)	b	Std.Err. (of b)	t(51)	p-value
Intercept			1.17	0.48	2.44	0.02
CUSAV	0.42	0.14	0.42	0.14	3.05	0.00
PEMAV	-0.04	0.12	-0.05	0.12	-0.37	0.71
ORGAV	0.38	0.14	0.32	0.12	2.59	0.01

All three variables combined account for 49% of the variation in strategic business value (R^2=0.49). The p-value is 0.00 for the customer satisfaction and 0.01 for the organizational agility therefore both of these variables are significant predictors of strategic business value.

Both customer satisfaction and organizational agility have a positive relationship with strategic business value, meaning if either customer satisfaction or organizational agility increase so will strategic business value. The p-value for performance management however is 0.71 and therefore it is not a significant predictor. Customer satisfaction has the highest Beta value of 0.42 and whilst organizational agility had the second highest Beta value of 0.32.

4.7 Qualitative Analysis

The participants' answers to the open ended questions were analysed using deductive thematic analysis. The researcher derived codes from the conceptual model, research objectives and survey questions as can be seen in Appendix D. The researcher categorised the codes into five themes namely; mobile BI usage, performance management, organizational agility, customer satisfaction and strategic business value. Each participant response was also given a unique number, for example P1 (see Appendix D).The findings of the qualitative analysis conducted on each theme can be found below:

4.7.1 Mobile BI Usage

Ten of the participants in this study confirmed that using mobile BI improved their information accessibility. Participants P1, P5, P12 and P13 felt mobile BI offered them convenience of information availability at any given time and that it increased their independence from being at a desk and chair. P1 described the information accessibility of mobile BI as follows:

"Saves time (information, instructions, reports) are sent immediately, Saves travel (do not need to go deliver information, etc), Increase my independence from a desk and chair".

Two participants indicated that navigation of BI content was difficult on mobile devices. P2 stated the following with regards to improving the mobile BI service:

"By simplifying some of the BI reports - some have too much content crammed in which makes navigation on small screen sizes difficult"

Verkooij and Spruit (2013) suggest that traditional and mobile BI differ in how they present information due to smaller screen sizes and inability to scroll through large quantities of information. According to Peters et al. (2014, pg 12) the "unsuitability of information, even if high quality, can easily lead to a less appropriate business decision". Receiving information at the right level of detail from mobile BI is therefore essential to aid decision making

4.7.2 Performance Management

According to participants P2 and P4 mobile BI enabled better visibility for employees when tracking their status with regards to achieving their targets. P3 indicated that mobile BI helped with identifying risks to employee objectives more appropriately. P4 described the performance management gained from mobile BI as follows:

"Easy visible tracking of where we are compared to where we want to be gives every employee the necessary impetus to drive through their own contribution and deliver an astounding performance".

This is similar to Tona and Carlsson (2013) who suggest that mobile BI can empower employees to make decisions and take actions which can result in improved productivity with regards to their individual targets.

P15 and P26 felt mobile BI facilitated faster organisational responsiveness which leads to improved organizational performance. P7 and P18 indicated that mobile BI enabled them to action events faster based on monitoring of KPI's. This was contrary to P7 and P34 who felt that their mobile BI solution was lacking in terms of performance reports. P18 described the performance functionality of mobile BI as follows:

"Alerts and notifications are delivered to key stakeholders on which to action"

4.7.3 Organizational Agility

Participants P35 and P36 stated that mobile BI gave them 360 degree visibility of their customers and opportunities. P9, P32 and P19 indicated that mobile BI allowed for quicker

responses to customer requests and market changes, owing to faster access to information. According to Verkooij and Spruit (2013), mobile BI can increase organizational agility as organisations are able to react more swiftly to market conditions from instant access to information.

P19 stated the following:

"Can respond quicker to customer requests and market changes when you have quicker access to information"

P31 indicated that mobile BI allowed the organization to stay abreast of a changing environment. P5 described mobile BI as providing rapid access to accurate and trusted information. Peters et al. (2014) posit that high quality information is important in the decision making process and reduces the uncertainty of the decision.

4.7.4 Customer Satisfaction

Participants P24 and P26 indicated that mobile BI helps enhance collaboration. P10 and P11 reported that mobile BI assisted with monitoring opportunities in CRM. P19 alluded to the fact that mobile BI helps to improve customer self- service by empowering customers to make better and faster decisions. P29 and P31 state that mobile BI keeps them closer to their clients and offers them more convenient ways of doing business. P16 describes how mobile BI helps users to attend to customer requests:

"It makes it easy to make changes to requirements if we are on the client's site and also be able to show potential customers our products/services when we are not in our base"

Verkooij and Spruit (2013) suggest that mobile BI improves customer satisfaction in customer facing roles such as sales as it allows instantaneous support and quick and accurate decisions. Tona and Carlsson (2013) agree that enhancing customer service is one of the benefits of mobile BI.

4.7.5 Strategic Business Value

Participants in this study were asked what role mobile BI plays in protecting or generating the organization's revenues and competitiveness. Out of the 34 participants that responded

to this question, nine of them felt that mobile BI played little to no impact in this regard. Four of the participants indicated that using real-time data from mobile BI gave them a competitive edge. P28 indicated that mobile BI contributed to competitiveness only if the information accessed through mobile BI was of a strategic nature. P33 felt that mobile BI contributed directly towards revenue generation through the ability to perform what-if analysis. P10, however, suggested that mobile BI contributes more to intangible benefits than a direct impact on revenue. P10 stated the following:

"It helps with our position in the market and how we are perceived. Revenue - not sure if it has a direct impact"

Five of the participants felt that mobile BI improved their decision making ability. P22 confirms the strategic business value of mobile BI as follows:

"By having real-time data, one can make more informed decisions that will gear toward increasing revenues and meeting customer requirements more effectively"

4.8 Chapter Summary

This chapter presented the results of the quantitative and qualitative analysis. The participants of this research were varied in terms of fulltime working experience, job title and highest level of education. The participants in this study were also classified as mobile employees with a majority of respondents spending more than a quarter of their time away from their desks. The statistical analysis performed showed that the research instrument used was both valid and reliable. The sample size of the research was 55 participants and this number was justified for the statistical analysis performed. The researcher however acknowledged that a larger sample size would have increased the reliability of statistical analysis. Regression analysis was also conducted to assess the effect of mobile BI usage on performance management, customer satisfaction and organizational agility. The effect of these 3 independent variables on strategic business value was also tested. These results of the regression testing are shown in Figure 4.8 below. The next chapter presents an interpretation and discussion of how well the research results support the research propositions.

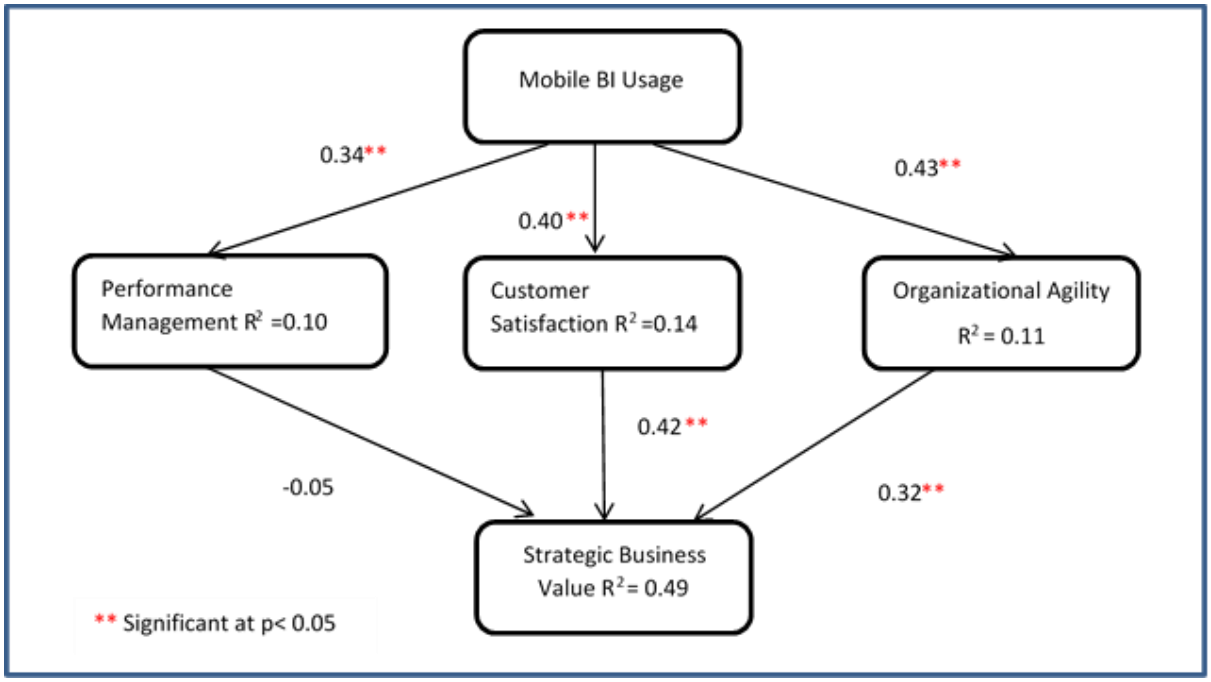


Figure 4.8: Results of Regression testing

5 Discussion

5.1 Introduction

The previous chapters described the research question, research objectives and propositions. The paper also presented the research design that was followed for this study as well as an analysis of the results obtained. The next step in the research process is to relate the findings to questions and propositions under investigation. This chapter offers reasons to support and or explain the findings of this study. This chapter also discusses the contribution of this research. The mobile BI users provided responses concerning their experience with using mobile BI and their answers provide insight into the ways organizations can realize business value from their investment in mobile BI.

The chapter is presented as follows: *Section 5.2* discusses the results obtained relative to the research objectives and existing literature on the topic. *Section 5.3* presents a summary of the chapter.

5.2 Discussion

The primary purpose of this research was to investigate the role mobile BI plays in enhancing an organization's performance and also how it creates business value. The main objectives were to establish ways by which mobile BI contributes towards strategic business value and to develop a conceptual model to guide this research. Research propositions were crafted from the conceptual model and these research propositions will now be evaluated.

Proposition 1: The use of mobile BI has a positive impact on performance management

Mobile BI usage was found to have a relationship with performance management that is statistically significant therefore showing support for the proposition above. The regression analysis in Table 4.5 reveals that there is a positive relationship between the two variables meaning as mobile BI usage increases so will performance management. The participants indicated, as shown in Section 4.3, that mobile BI enabled them to be clearer about strategic

objectives and provided them with key performance indicators to drive better decision making. This is similar to studies by Tona and Carlsson (2013), Verkooij and Spruit (2013) which state that mobile BI empowers employees to make decisions and take actions which can result in improved efficiency and productivity.

Proposition 2: The use of mobile BI has a positive impact on organizational agility

Chen & Siau's (2011) study found that organisations can achieve greater agility by using BI to detect customer patterns and identify operational opportunities. In Section 4.3 the participants indicated that mobile BI enabled their organization to respond to customer requirements as well as to threats and market opportunities more effectively. The regression analysis in Table 4.6 shows that there is a statistically significant relationship between mobile BI and organizational agility. Mobile BI usage was also found to be a significant predictor of organizational agility. This implies that the above proposition is supported. This is in line with literature. Studies by Airinei & Homocianu (2010) and Peters et al. (2014) both found that mobile BI offers advantages of business agility through improved decision making with real time data.

Proposition3: The use of mobile BI has a positive impact on customer satisfaction

Section 4.3 shows that the research participants agreed that mobile BI usage creates more effective customer interactions. This is similar to Verkooij and Spruit (2013), Tona and Carlsson (2013) who suggest that mobile BI improves customer satisfaction in customer facing roles as it allows instantaneous support and quick and accurate decisions. Regression testing was used to test the relationship between mobile BI usage and customer satisfaction. The relationship between the two was found to be statistically significant proving the proposition stated above. The relationship was also found to be positive in nature meaning that as mobile BI usage increases so does customer satisfaction.

P**roposition 4: The effectiveness of performance management has a positive impact on strategic business value.**

The relationship between performance management and strategic business value was not statistically significant therefore this proposition was not supported. This is contrary to Ventana (2011) and Tona and Carlsson (2013) who state that mobile BI enables employees

to do productive work while out on the road improving organizational performance and competitiveness.

The demographic data shows that 54% of the participants accessed mobile BI via smartphones which generally have smaller display screens compared to tablet devices. In the results in section 4.7 participants also indicated that their mobile BI solutions were lacking in terms of performance reports. These may both be possible reasons why performance management was not found to have a positive impact on strategic business value. In addition Peters et al. (2014) state that there is a possibility that the mobile BI users can fail to recognize the performance improvements that have been caused by mobile BI. This suggests that there may be some impacts of performance management on strategic business value that have been overlooked.

Proposition 5: Higher customer satisfaction levels have a positive impact on strategic business value of an organisation.

Customer satisfaction was found to have a statistically significant relationship with strategic business value therefore the above mentioned proposition was supported. The participants indicated in section 4.7 that mobile BI increases collaboration with customers and this is one of the measures of customer satisfaction. The participants also revealed that mobile BI is able to offer intangible benefits such as improving how the firm is perceived in the market.

Sun and Kim (2013), Anderson et al. (1994) suggest that customer satisfaction can be linked with the perceived quality of a company's products and services and it can therefore be used as a key performance metric in measuring a firm's competitiveness.

Proposition 6: Increased organizational agility has a positive impact on the strategic business value of an organization.

Chen & Siau (2011) confirm that there is an established link between organizational agility and firm performance, by virtue of agility being a contributor towards a firm's competitive advantage. The regression analysis in Table 12 revealed that organizational agility was found to have a statistically significant relationship with strategic business value; therefore the above mentioned proposition was supported. This finding is consistent with literature.

Both the studies by Verkooij and Spruit (2013) as well as Brozin and Stipić (2011) found that organisations adopting mobile BI could anticipate benefits of faster response to market conditions, better decision making and ultimately competitive advantage.

Proposition 7: Enhanced customer satisfaction, performance management and organizational agility all have a significant contribution towards creating strategic business value.

The research results show support for the above mentioned proposition. According to Figure 13 the results show that customer satisfaction, organizational agility and performance management accounted for a substantial amount of the variation in strategic business value (R^2= 0.49). The regression analysis in Table 4.7 shows that customer satisfaction is the most significant predictor of strategic business value. Chan et al. (2004) argue that organisations which are able to understand customer demands and requirements through better sensing are more likely to create customer satisfaction, increased customer loyalty and improved sales.

According to Pulipati (2012) increased competitive advantage, increased business agility and increased sales and profitability are some of the benefits organisations seek when adopting mobile BI. The participants indicated, in Section 4.7, that using mobile BI offered them the benefit of saving time from not being bound to the office thereby increasing productivity and reducing costs. The mobile BI users also indicated that mobile BI helped them with revenue generation through the ability to perform what-if analysis and also access to real time data for fact based decision making. These results show that mobile BI is able to create strategic business value through improving financial performance as a result of easier access to information anytime anywhere.

5.3 Chapter Summary

This study set out to examine how mobile BI is creating strategic business value in organizations by positively impacting the performance management, customer satisfaction and organizational agility of these organisations. Mobile BI was found to positively impact performance management, customer satisfaction and organizational agility. This study found both organizational agility and customer satisfaction to have a strong impact on

strategic business value. Chan et al. (2004) suggest that organisations can understand customer demands and requirements through better sensing and are thus more likely to create customer satisfaction, increased customer loyalty and improved sales.

It was surprising to note that performance management was not a significant predictor of strategic business value. This may have been attributed to the large number of smartphone users that took part in the survey as well as the lack of sufficient performance reports being delivered to mobile BI users. The study did however deliver some encouraging findings that mobile BI increases employee's independence from the office and also saves employee's time thereby reducing costs and potentially increasing revenues in the long run.

6 Conclusion

Currently, there is a growing need for mobile BI in the business world as the nature of work is changing and employees are more mobile than ever before. Whilst mobile BI is high on many directors' agendas BI practitioners are not convinced about the real business value to be gained from this undertaking. Verkooij and Spruit (2013) agree that whilst there is much discussion about implementing mobile BI, the business value of mobile BI remains quite poorly understood. Tona & Carlsson (2013) also point out the present need for practitioners' to understand how mobile BI usage affects decision making processes and brings about organizational changes in the long run.

Organizations which are able to incorporate mobile business more comprehensively into their value chain activities can reap higher levels of business value (Picoto et al., 2012). According to Basole (2007) there are a number of value offerings associated with adopting mobile business applications such as mobile BI. These value offerings include improved access capabilities, cost savings, improved accuracy and productivity as well as increased organisational responsiveness.

A review of the literature available on mobile BI revealed that most research is focused mainly on the adoption and implementation of mobile BI. Due to the field of mobile BI still being in its infancy, there is a need for research which addresses the business value of mobile BI. The purpose of this research was to investigate how mobile BI can be used to create strategic business value. The research sought to examine how mobile BI improves the users' decision making and enables them to execute productive work while out on the road. The research also explored how mobile BI impacts organizational agility and customer satisfaction which enhance the competitiveness of the firm.

A conceptual model was developed from key literature and it was used as the framework for this study. A mixed methods strategy was adopted for this research and the data was collected from 55 mobile BI users within various industries via a web based survey.

Deductive thematic analysis was used for the open ended questions in the survey and regression analysis was used to test the research propositions.

The findings revealed that organizations with a more extensive usage of mobile BI are able to achieve higher levels of performance management, customer satisfaction and organizational agility. The results also suggest that higher levels of mobile BI usage have a significant impact on value chain activities, with customer satisfaction contributing the most towards strategic business value. In addition mobile BI was found to improve accessibility and also reduce costs by saving employees' time and reducing the need to travel to the office.

6.1 Implications for academics, practitioners and society

All the research propositions were supported except for performance management which was not found to be a significant predictor of strategic business value. The propositions testing the impact of mobile BI on performance management, customer satisfaction and organizational agility were all found to be positive. The results also showed that organizational agility and customer satisfaction were significant predictors of strategic business value. The reliability test showed that all the constructs met the criteria of having a Cronbach Alpha of 0.7 or higher. The validity test also revealed that all the variables in the research instrument grouped into five factors corresponding with the five constructs found in the conceptual model.

This research also indicated that navigation of BI content was difficult on mobile devices which have relatively small screens such as smartphones. This asserts that mobile BI has not moved past some of the initial restrictions related to the device used to access mobile BI. Smartphones were used by the majority of the sample and as a result these smartphones could be inhibiting the mobile BI users from deriving the maximum advantage from their mobile BI usage. Due to the findings, BI practitioners are encouraged to present the key information supplied by mobile BI in a visually attractive manner for smaller screens. They can also make use of the context and location based features of mobile devices to ease some of the restrictions encountered by smartphone users.

This research makes contributions to the literature, theory and practice in the field of mobile BI. It contributes to the existing literature by providing empirical evidence on the business value of mobile BI. Second, it contributes to the existing theory by identifying factors such as performance management, organizational agility and customer satisfaction which affect strategic business value and also empirically tests these relationships. Lastly it makes recommendations for practice and provides practitioners with a framework for assessing mobile BI business value.

6.2 Limitations

Whilst this research made several contributions with regards to mobile BI business value, the researcher has to acknowledge, as with all research, this research had its limitations. The research design decisions, as well as certain flaws in sampling, data collection and analysis may have also had an impact on the reliability of the findings and conclusions.

This study was primarily limited by its small sample size. The researcher's timeframe was restricted by a delay in obtaining the necessary organisational permission. An earlier start in data collection would have increased the time needed to survey more participants and thus increased the sample size. Performance management was not found to be significant predictor of strategic business value and this could be due to the small sample size lacking diversity. A larger sample size could have also resulted in data with a normal distribution and this would have created more opportunities for further statistical tests.

Assessing mobile BI business value is an ongoing process. With the cross sectional approach the researcher was able to see some of the value created by mobile BI. It would however be interesting to take a longitudinal research approach which tracks improvements in strategic business value from mobile BI adoption stage until the organisational has fully integrated mobile BI.

6.3 Future research

Future research should include more top level management in the sample as they are likely to have a higher awareness of how performance management can impact the strategic business value of an organisation. Replicating the study with a larger sample would result in a more normally distributed population and this would verify whether performance management truly has an impact on strategic business value or not.

The results showed that higher levels of mobile BI usage result in higher levels of strategic business value. Future research can therefore examine whether organisations can increase mobile BI usage and consequently strategic business value by giving their employees more training and spreading awareness of mobile BI benefits.

Furthermore, a longitudinal research could also yield better results as this would ensure collection of data over a longer period of time. In the present study the user responses concerning mobile BI were at a particular point in time and these perceptions can change over time as the users gain more experience with mobile BI.

This study shows that mobile BI is able to contribute in terms of improving an organizations agility which is key to coping with the pressures of faster decision cycles and a constantly changing environment. The researcher hopes that this study validated the positive contribution that mobile BI has to offer, and that it points researchers in the right direction for future studies related to mobile BI business value and competitiveness of the firm.

7 References

Airinei, D., & Homocianu, D. (2010). The Mobile Business Intelligence Challenge. *Economy Informatics*, *10*(1), 5–12.

Anderson, E. W., Fornell, C., & Lehmann, D. R. (1994). Customer Satisfaction , Market and Profitability : Findings From. *Journal of Marketing*, *58*(3), 53–66.

Ariyachandra, T. R., & Frolick, M. N. (2008). Critical Success Factors in Business Performance Management — Striving for Success. *Information Systems Management*, *25*(2), 113 – 120.

Atapattu, M., & Sedera, D. (2013). Agility : Customer ' s Perspective. In *PACIS 2013 Proceedings. Paper 267* (pp. 1 – 18).

Atkinson, M. (2012a). Developing and using a performance management framework : a case study. *Measuring Business Excellence*, *16*(3), 47–56. doi:10.1108/13683041211257402

Atkinson, M. (2012b). Developing and using a performance management framework : a case study. *Measuring Business Excellence*, *16*(3), 47–56.

Augier, M., & Teece, D. J. (2009). Dynamic Capabilities and the Role of Managers in Business Strategy and Economic Performance. *Organization Science*, *20*(2), 410–421. doi:10.1287/orsc.1090.0424

Baars, H., & Zimmer, M. (2013). A Classification For Business Intelligence Agility Indicators. In *ECIS 2013 Completed Research. Paper 163.* (pp. 1 – 13).

Basole, R. C. (2007). The Emergence of the Mobile Enterprise: A Value-Driven Perspective. In *International Conference on the Management of Mobile Business (ICMB 2007)* (pp. 41–41). Ieee. doi:10.1109/ICMB.2007.63

Bhattacherjee, A. (2012). *Social Science Research: Principles, methods, and practices*.

Bitterer, A. (2011). *Hype Cycle for Business Intelligence , 2011* (pp. 1 – 56). Gartner. Stamford.CT.

Blumberg, B., Cooper, D., & Schindler, P. (2008). *Business Research Methods* (Vol. 2). New York: McGraw Hill Higher Education.

Braun, V., & Clarke, V. (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology*, *3*(2), 77–101.

Brockmann, T., Kmieciak, J., Diederich, S., & Stieglitz, S. (2012). User Acceptance of Mobile Business Intelligence Services. In *In Network-Based Information Systems (NBiS), 2012 15th International Conference on.IEEE* (pp. 861 – 866).

Brozin, T., & Stipić, A. (2011). Mobile BI : The Past , The Present and The Future. In *MIPRO 2011* (pp. 1560–1564).

Bucher, T., Gericke, A., Sigg, S., & Ag, S. A. P. (2009). Process-centric business intelligence. *Business Process Management Journal*, *15*(3), 408 – 429. doi:10.1108/14637150910960648

Buchner, T. W. (2007). Performance management theory: A look from the performer's perspective with implications for HRD. *Human Resource Development International*, *10*(1), 59–73.

Carson, D., Gilmore, A., Perry, C., & Gronhaug, K. (2001). *Qualitative Marketing Research*. SAGE Publications, Ltd. doi:10.4135/9781849209625

Cavana, R., Delahaye, B. L., & Sekara, U. (2001). *Applied Business Research: Qualitative and quantitative methods*. Australia: John Wiley & Sons.

Chan, S., Lam, J., Fang, X., & Brezezinski, J. (2004). Customization and Customer Satisfaction for Mobile Commerce. In *AMCIS 2004 Proceedings* (pp. 3877 – 3883).

Chen, H., Chiang, R. H., & Storey, V. C. (2012). Business Intelligence and analytics : from big data to big impact. *MIS Quarterly*, *36*(4), 1165–1188.

Chen, L., Meservy, T. O., & Gillenson, M. (2012). Understanding Information Systems Continuance for Information-Oriented Mobile Applications. *Communications of the Association for Information Systems*, *30*(9), 127 – 146.

Chen, X., & Siau, K. (2011). Impact of Business Intelligence and IT Infrastructure flexibility on Competitive Performance: An Organizational Agility Perspective. In *Thirty Second International Conference on Information Systems , Shangi 2011* (pp. 1–11).

Churchill, G. A., & Surprenant, C. (1982). An investigation into the determinants of customer satisfaction. *Journal of Marketing Research*, *19*(4), 491 – 503.

Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. London: Sage.

Crossland, M. (2010). *How Business Intelligence is adding business value*. Unpublished MCom thesis, University of Cape Town.

Davenport, T. H. (2006). Competing on Analytics. *Harvard Business Review*, *84*(11), 99–107.

Derballa, V., & Pousttchi, K. (2004). Extending Knowledge Management to Mobile Workplaces. In *In Proceedings of the 6th international conference on Electronic commerce . ACM* (pp. 583–590).

Dinter, B., & Lorenz, A. (2012). Social Business Intelligence : a Literature Review and Research Agenda. In *Thirty Third International Conference on Information Systems (ICIS 2012)* (pp. 1–21).

Dresner Advisory. (2012). Wisdom of Crowds ® Mobile Computing / Mobile Business Intelligence Market Study Licensed to MicroStrategy, (November), 2 – 76.

Eckerson, W. (2011). *A Complete Primer To Mobile BI* (pp. 1–16).

Edwards, J. E. (2007). *How To Conduct Organizational Surveys A Step-by-Step Guide* (pp. 91–97). Sage Publications.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities : What are they? *Strategic Management Journal*, *21*(10 -11), 1105 – 1121.

Elbashir, M. Z., Collier, P. A., & Davern, M. J. (2008). Measuring the effects of business intelligence systems : The relationship between business process and organizational performance. *International Journal of Accounting Information Systems*, *9*(3), 135–153.

Elbashir, M. Z., Collier, P. A., Sutton, S. G., Davern, M. J., & Leech, S. A. (2013). Enhancing the Business Value of Business Intelligence: The Role of Shared Knowledge and Assimilation. *Journal of Information Systems*, *27*(2), 87–105. doi:10.2308/isys-50563

Fereday, J., & Muir-cochrane, E. (2006). Demonstrating Rigor Using Thematic Analysis : A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *International Journal of Qualitative Methods*, *5*(1), 80 – 92.

Field, A. (2009). *Discovering Statistics using SPSS* (Third Edit.). London: Sage Publications.

Flowers, P. (2009). Research Philosophies – Importance and Relevance. *Economic Record*, *1*(3), 1–5.

Gasser, L., Twidale, M. B., & Smith, L. C. (2007). A Framework for Information Quality Assessment. *Journal of the American Society for Information Science and Technology*, *58*(12), 1720–1733. doi:10.1002/asi

Gruman, J. A., & Saks, A. M. (2011). Human Resource Management Review Performance management and employee engagement. *Human Resource Management Review*, *21*(2), 123–136.

Guba, E., & Lincoln, Y. (1994). *Competing Paradigms in Qualitative Research, Handbook of qualitative research* (pp. 163 – 194). Sage.

Haider, A., & Lee Hyun, S. (2012). Using Six Sigma for Continuous Improvement of Asset Management Information Quality Using Six Sigma for Continuous Improvement of Asset. In *CONF-IRM 2012 Proceedings. Paper 59.* (pp. 1–13).

Isik, O., Jones, M. C., & Sidorova, A. (2013). Information & Management Business intelligence success : The roles of BI capabilities and decision environments. *Information & Management*, *50*(1), 13–23.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research : A Research Paradigm Whose Time Has Come. *Educational Researcher*, *33*(7), 14–26.

Koch, H., & Curry, P. (2014). IT Consumerization ' s Impact on Enterprise IT. In *Twentieth Americas Conference on Information Systems* (pp. 1–11).

Liang, T.-P., Huang, C.-W., Yeh, Y.-H., & Lin, B. (2007). Adoption of mobile technology in business: a fit-viability model. *Industrial Management & Data Systems*, *107*(8), 1154–1169.

Lonnqvist, A., & Pirttimaki, V. (2006). The Measurment of Business Intelligence. *Information Systems Management*, *23*(1), 32.

Malhotra, N. K. (2006). *Questionnaire Design and Scale Development* (pp. 83–94). Thousand Oaks: CA: Sage Publications.

Markus, M. L., & Soh, C. (1995). How IT creates Business Value: A process theory synthesis. *In Proceedings of the International Conference on Information Systems*, 29 –42 Society for Information Management.

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Review: Information Technology and Organizational Performance: An Integrative model of IT Business Value, *28*(2), 283–322.

Migiro, S. O., & Magangi, B. A. (2011). Mixed methods : A review of literature and the future of the new research paradigm. *Journal of Business Management*, *5*(10), 3757–3764.

Miller, K. W., Voas, J., & Hurlburt, G. F. (2012). BYOD : Security Considerations. *IT Professional*, *15*(5), 53–56.

Mladenova, V., Homann, M., Kienegger, H., Wittges, H., & Krcmar, H. (2011). Towards an Approach to Identify and Assess the Mobile Eligibility of Business Processes. In *AMCIS 2011 Proceedings - All Submissions. Paper 264.* (pp. 1 – 11).

Moy, J. (2014). *Deconstructing SAP Fiori Apps - June 2014*. Retrieved June 18, 2014, from http://www.bluet.com.au/2014/06/12/deconstructing-sap-fiori-apps-june-2014/

Negash, S. (2004). Business Intelligence. *Communications of the Association for Information Systems*, *13*(2004), 177–195.

O'Donnell, P., Sipsma, S., & Watt, C. (2012). The critical issues facing business intelligence practitioners. *Journal of Decision Systems*, *21*(3), 203 – 216.

Otto, B., Wende, K., Schmidt, A., & Osl, P. (2007). Towards a Framework for Corporate Data Quality Management Towards a Framework for Corporate Data Quality Management. In *ACIS 2007 Procceedings. Paper 109.* (pp. 916 – 926).

Overby, E., Bharadwaj, A., & Sambamurthy, V. (2006). Enterprise agility and the enabling role of information technology. *European Journal of Information Systems*, *15*, 120–131. doi:10.1057/palgrave.ejis.3000600

Peters, T., Popovic, A., Isik, O., & Weigand, H. (2014). The role of Mobile BI capabilities in Mobile BI. In *European Conference in Information Systems 2014 Proceedings* (pp. 1–17).

Picoto, W., Belanger, F., & Palma-dos-Reis, A. (2012). Leveraging on mobile business to enhance firm performance: An organizational level study. In *ECIS 2012 Proceedings.Paper 113*.

Pousttchi, K., & Habermann, K. (2009). Exploring the Organizational Effects of Mobile Business Process Reengineering. In *2009 Eigth International Conference on Mobile Business IEEE* (pp. 353–358).

Pousttchi, K., Weizmann, M., & Turowski, K. (2003). Added Value-based Approach to Analyze Electronic Commerce and Mobile Commerce Business Models. In *Proceedings of the Interantional Conference of Management and Technology in the New Enterprise, La Habana* (pp. 414 – 423).

Pulipati, S. (2012). Mobile Business Intelligence : Intelligence at the Fingertips. *International Conference on Business Management & Information Systems*, 369 – 376. Retrieved from http://www.oracle.com/us/solutions/business-intelligence/oracle-mobile-bi-ebook-ds-501071.pdf

Ramadani, B. (2009). *Realizing Business Value from IT Assets*. Retrieved October 20, 2013, from http://www.som.cranfield.ac.uk/som/dinamic-content/research/documents/partners.pdf

Rangone, A. (1999). A Resource-Based Approach to Strategy Analysis in Small-Medium Sized Enterprises. *Small Business Economics*, *12*(3), 233–248.

Roambi. (2013). *Sales. Get your data where you are - everywhere*. Retrieved April 28, 2014, from http://www.roambi.com/solutions/job-role/sales

Roberts, N., & Grover, V. (2012). Investigating firm ' s customer agility and firm performance : The importance of aligning sense and respond capabilities. *Journal of Business Research*, *65*(5), 579–585. doi:10.1016/j.jbusres.2011.02.009

Sallam, R., Richardson, J., Hagerty, J., & Hostmann, B. (2011). *Magic Quadrant for Business Intelligence Platforms*. *Gartner Group* (Vol. Stamford,). Stamford CT.

SAP. (2103). *Introducing SAP Fiori. Keeping Simple Things Simple*.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (Fifth.). Pearson Education.

Scheepers, H., & McKay, J. (2004). An Empirical Assessment Of The Business Value Derived From Implementing Mobile Technology : A Case Study Of Two Organisations. In *in ECIS* (pp. 1693 – 1705).

Schryen, G. (2012). Revisiting IS business value research : what we already know , what we still need to know , and how we can get there. *European Journal of Information Systems*, *22*(2), 139–169. Retrieved from http://dx.doi.org/10.1057/ejis.2012.45

Stodder, D. (2013). Achieving Greater Agility with Business intelligence. *TDWI Best Practices Report First Quarter*, 1 – 40.

Sun, K.-A., & Kim, D.-Y. (2013). Does Customer Satisfaction increase firm performance. An application of American Customer Satisfaction Index (ACSI). *International Journal of Hospitality Managment*, *35*, 68 – 77.

Tapadinhas, J. (2012). *Critical Capabilities for Mobile BI What You Need to Know* (pp. 1–80). Retrieved 22 November from http://www.ciosummits.com/media/pdf/solution_spotlight/GartnerApril2012_Critical_Capabilities_for_MobileBI.pdf

Tona, O., & Carlsson, S. A. (2013). The Organizing Vision Of Mobile Business Intelligence. In *ECIS 2013 Completed Research. Paper 114* (pp. 1–13).

Trif, S., & Visoiu, A. (2011). A Windows Phone 7 Oriented Secure Architecture for Business Intelligence Mobile Applications 1. *Informatica Economica*, *15*(2), 119–129.

Twentyman, J. (2012). *Mobile BI as a tool of democracy in south africa*. Retrieved July 07, 2013, from http://www.enterpriseappexpo.com/mobile-bi-as-a-tool-of-democracy-in-south-africa#.UpQ1eRcaLIW

Ventana. (2011). The Challenge of Mobile Business Intelligence Developing a Successful Strategy for the New Mobility White Paper, 2 – 9.

Verkooij, K., & Spruit, M. (2013). Mobile Business Intelligence: Key considerations for implementation projects. *Journal of Computer Information Systems*, *54*(1), 1–19.

Watson, H. J., & Wixom, B. H. (2007). The Current State of Business Intelligence. *IEEE*, 96 – 99.

Watson, H. J., Wixom, B. H., & Yen, B. (2013). Delivering Value through Mobile Business Intelligence. *Business Intelligence Journal*, *18*(1), 4–7.

Yan, C. H. U., & Lihua, H. (2005). Mobile Business Applications Adoption Model Based on the Concents of Task/Technology Fit. *In Services Systems and Services Management, 2005. Proceedings of ICSSSM'05. 2005 International ConferenceIEEE*, *2*, 1346–1350.

Yogesh, D., Williams, M., Mitra, A., Niranjan, S., & Weerakkody, V. (2011). Understanding Advances in Web Technologies: Evolution from Web 2.0 to Web 3.0. In *European Conference on Information Systems (ECIS)* (pp. 1–13).

Yogev, N., Fink, L., & Even, A. (2012). How Business Intelligence creates value. In *ECIS 2012 Proceedings. Paper 84* (pp. 1 – 12).

Appendix A- Mobile BI Survey

Section A
For how many years have you been working full-time? (1= less than a year; 2= 2 to 5 years; 3= 5 to 10 years; 4 =10 to 20 years; 5=over 20 years)
Please indicate your highest level of education? (1 = Matric; 2 = Higher Diploma; 3 =Bachelors Degree; 4=Masters Degree; 5=Doctor of Philosophy, 6=Professional certificate,7 =Honours)
What is your current job title? (1=Sales/Pre-sales staff; 2= Middle-level management; 3=First level supervisor; 4 = Top-level management/executives)
Do you use a personal mobile device for work purposes? (1 = Yes; 2= No)
What type of smart device do you use to access mobile BI? (1=Smartphone; 2 =Tablet PC; 3= Both)
What percentage of time do you spend away from your desk? (1=less than 25%; 2=25% to 50%; 3=50 to 75%; 4=over 75%)

Section B	**Information Quality**
IQ1	Mobile BI allows me to access information from any location at any given time. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
IQ2	The information provided by mobile BI is relevant and at the right level of detail. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
IQ3	The information related to tasks I complete with mobile BI is easy to digest. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
IQ4	The mobile BI service provides up to date information. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
Section C	**Trust/Security**
TR1	The Mobile BI service offers me a sense of control through protecting my

	privacy as the user. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
TR2	I am able to rely on the availability and responsiveness of the Mobile BI service. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
TR3	There is secure delivery of information and security guidelines are enforced when using mobile BI. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
TR4	The Mobile BI service is more easily accepted when the security of confidential business information is conserved. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)

Section D	**Performance Management**
PEM1	Please select the most prevalent type of Business Intelligence (BI) functionality being offered on your mobile device Dashboards Data Visualization Alerts and activity monitoring Advanced analytics, including in-memory
PEM2	Please prioritize the BI and analytics mobile device features listed below in order of importance when completing your operational tasks. Drag and drop with number 1 being the highest priority. Metrics and Key performance indicators ___ Browse, filter and search for dashboards and reports___ Data Drill down and drill up_____ Ad hoc querying and reporting _____ Data access to live data sources____
PEM3	Mobile BI helps with reporting and communicating corporate and financial performance information effectively. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)

PEM4	Mobile BI delivers Key Performance Indicators appropriately to drive better decision making. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
PEM5	Mobile BI enables employees to be more clear about their contribution towards strategic objectives (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
PEM6	Mobile BI improves the process of identifying and managing risks to employee objectives more appropriately. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)

Section E	**Organizational Agility**
ORA1	Please react to the following statement "My organization is culturally well prepared to use mobile BI for maximum advantage" (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
ORA2	The tasks for which mobile BI is used need to be addressed immediately as the information is perishable and loses value if not acted upon right away. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
ORA3	Mobile BI enables my organization to quickly respond to and deal with the changing requirements of customers. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
ORA4	Mobile BI enables me to react faster to threats or opportunities in the market through improved access to information. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
ORA5	Mobile BI improves the ability of the organisation in applying customer information to develop new service and products. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)

Section F	**Customer Satisfaction**
CUS1	Customer Self-service is customers' ability to attend to their own information requests Mobile BI improves convenience to customers and is also able to provide better customer self-service. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
CUS2	Mobile BI enables customer's service innovation through improved responding to customer requests. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
CUS3	Mobile BI reduces the time needed to sell products and provide other valuable services to customers. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
CUS4	Mobile BI provides instant data delivery enabling more effective customer interactions and improved customer satisfaction. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree

Section G	**Strategic Business Value**
SBV1	There is more efficiency and coordination in operations and business processes through improved employee performance management resulting from mobile BI use. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
SBV2	Mobile BI improves customer satisfaction ratings through improved collaboration with clients leading to faster customer care service. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
SBV3	Mobile BI positively impacts sales and revenues through customer innovation from improved responsiveness to customer requests (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
SBV4	There are an increased number of employee suggestions per employee due to mobile BI assisting the organization to be more agile and focused on

	continuous improvement. (1=strongly disagree;2=disagree; 3=uncertain;4=agree; 5=strongly agree)
SBV5	What role does Mobile BI play in generating or protecting your organization's revenues and/or competitiveness?
SBV6	How does Mobile BI boost your organization's performance?
SBV7	How do you think your organization can increase the value it derives from its investment in Mobile BI?

Appendix B – Ethics form

UNIVERSITY OF CAPE TOWN
FACULTY OF COMMERCE
Igniting Knowledge and Opportunity

Commerce Faculty Ethics in Research Committee

Updated Ethics Form March 2013

Any individual in the Faculty of Commerce at the University of Cape Town undertaking any research that involves the use of human subjects, or research that may hold ethical consequences for the University of Cape Town, is required to complete this form and obtain approval before conducting research. The completed form should be submitted as an electronic document to departmental Ethics Committee representatives for submission to the Commerce Faculty Ethics in Research Committee. Please also submit electronic copies of your research proposal, informed consent form or other information used to obtain consent, and any questionnaires other material shown to subjects.

1. PROJECT DETAILS		
Project title: Leveraging Mobile Business Intelligence to create Business Value.		
Principal Researcher/s: Kudzai Kashora	**Email address(es):** kudzkash@gmail.com	
Research Supervisor: Derek Smith	**Email address(es):** Derek.Smith@uct.ac.za	

Co-researcher(s):	**Email address(es):**	

Brief description of the project:

The main purpose of this research is to investigate how mobile Business Intelligence (BI) can be leveraged to create strategic business value in organizations that have adopted this phenomenon. In order to achieve this goal this research will explore the ability of mobile BI to improve employee efficiency and productivity through more constant access to actionable information. It will further attempt to explore how mobile BI usage can lead to improved customer engagement and improved responsiveness to customer requests.

Data collection: (please select)

☐Interviews ✓ Questionnaire ☐Experiment ☐Secondary data ☐Observation

☐ Other (please specify): _____

Procedure: (please describe)

The primary source of data in this study is that of anonymous questionnaire responses facilitated by a

web-based survey instrument.

2. PARTICIPANTS

Characteristics of participants:

Gender:	Any
Race / Ethnicity:	Any
Age range:	Adults (aged 18 and above)
Location:	Western Cape and Gauteng, South Africa
Other:	

Race / Ethnicity:

Have you included a "**Prefer not to Answer**" response category in your questionnaire? (please select)

☐ Yes ☐No ✓ Not applicable

If you answered 'No' why not?

Affiliations of participants: (please select)

✓ Company employees ☐UCT staff ☐General public ☐UCT Students

☐ Other (please specify): _____

If your sample includes children (aged 18 and below), mentally incompetent persons, or legally restricted groups please explain below why it is necessary to use these particular groups. If subjects are minors or mentally incompetent, please describe how and by whom permission will be granted? If you are including children under the age of 18 and are not getting parental consent, please explain why you believe that their parents would consent if it was possible to contact them.

3. ORGANISATIONAL PERMISSION

If your research is being conducted within a specific organisation, please provide organisational permission or explain how permission will be obtained.

I will send a letter to the organisation requesting permission to conduct my research in the organisation. This letter will be sent to the Presales Manager who is the contact person in the company and they will forward it to any higher levels of management necessary to obtain authorization.

Are you making use of UCT students as respondents for your research? (please select) ☐ Yes ✓ No

If yes, have you contacted Executive Director: Student Affairs for permission? (please select) ☐ Yes ☐ No

Was approval granted? (please select) ☐ Yes ☐ No ☐ Awaiting a response

Are you making use of UCT staff as respondents for your research? (please select) ☐ Yes ✓ No

If yes, have you contacted Executive Director: Human Resources for permission? (please select) ☐ Yes ☐ No

Was approval granted? (please select) ☐ Yes ☐ No ☐ Awaiting a response

Contact Emails: Executive Director: Human Resources (**Miriam.Hoosain@uct.ac.za)**
Executive Director: Student Affairs (**Moonira.Khan@uct.ac.za)**

4. INFORMED CONSENT

What type of consent will be obtained from study participants?

☐ written consent

✓ anonymous survey

☐ oral consent (please justify)

☐ other (please specify)

How and where will consent/permission be recorded? As participation is anonymous, consent of respondents will not be specifically recorded. The invitation for participation letter will however accompany all the survey forms. The organisation consent letter will be signed and stored in a safe location

5. CONFIDENTIALITY OF DATA

What precautions will be taken to safeguard identifiable records of individuals? Please describe specific procedures to be used to provide confidentiality of data by you and others, in both the short and long run. This question also applies if you are using secondary sources of data that is not anonymous.

The organisation participating in the survey will be given an alias to ensure that the information supplied by the organisation remains private and confidential.

Signed organisation consent forms will be stored in a secure location such as a physical safe.

6. RISK TO PARTICIPANTS

Does the proposed research pose any physical, psychological, social, legal, economic, or other risks to study participants you can foresee, both immediate and long range? **(please select)**

☐ Yes ✓ No

If yes, answer the following questions:

1. Describe in detail the nature and extent of the risk and provide the rationale for the necessity of such risks
2. Outline any alternative approaches that were or will be considered and why alternatives may not be feasible in the study

1.
2.
3.

What authorship agreement have you reached with your co-researchers or supervisor?

☐ This research is not intended for publication

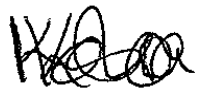
✓ Standard authorship agreement (principal researcher first author, co-researcher(s) and supervisor(s) co-authors)

☐ Customised agreement (please specify below):

I certify that we have read the the UCT Authorship Policy, and Commerce Faculty Authorship Guidelines ✓ (http://www.commerce.uct.ac.za/Commerce/Information/research.asp)

I certify that that the material contained herein is truthful and that all co-researchers and supervisors are ✓ aware of the contents thereof.

I understand that it is my responsibility to conduct research in accordance with the ethical requirements of ✓ UCT.



Applicant's signature:

Date: 26/11/2013

CHECKLIST	SELECT
A full copy of a research proposal or a literature review with methodology is attached	✓
Research proposal/ interview schedules / cover letters / questionnaires / forms and other materials used in the study are attached/ consent form	✓
Organisational consent letter / UCT student or staff approval letter	✓
On your cover letter to your questionnaire have you included the following? **1. The following UCT Logo** 	✓
2. A sentence explaining the aim of the research	✓
3. Sentences of a similar nature to below must be included in the cover letter or consent form:	

This research has been approved by the Commerce Faculty Ethics in Research Committee.	✓
Your participation in this research is voluntary. You can choose to withdraw from the research at any time.	✓
The questionnaire will take approximately X minutes to complete	✓
You will not be requested to supply any identifiable information, ensuring anonymity of your responses.	✓
Due to the nature of the study you will need to provide the researchers with some form of identifiable information however, all responses will be confidential and used for the purposes of this research only.	**OR** ☐
Should you have any questions regarding the research please feel free to contact the researcher (insert contact details).	✓
4. Have you scanned in your signature for the last section of the form?	✓

For Ethics committee representative only **Recommendation(s):** **Signature:** **Date:**
For Ethics committee chairperson only **Recommendation:** **Signature:** **Date:**

Appendix C- Invitation for Participation in Study

Department of Information Systems

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15 April 2014

Dear Sir/Madam,

I am currently enrolled in a part-time Masters programme in Information Systems at the University of Cape Town and am required to conduct a research project as part of this course.

The title of my research is *'Leveraging Mobile Business Intelligence to create Business Value'* and the purpose of this research is to ascertain whether the organizations that have implemented Mobile Business Intelligence (BI) are deriving organizational performance improvements from this information technology. This research is being conducted for academic purposes and the results of this research will be submitted as part of my final thesis deliverable.

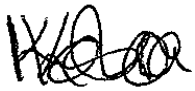
Prior to undertaking the study I need your consent to approach the mobile BI users within your organisation to take part in the study. I will recruit participants to the study via email with a URL link to the web-based survey. I hope to recruit 70 participants who will each need to spend approximately 10 minutes completing the survey. I can assure you that I will make every effort to ensure the study does not disrupt the working environment in any way and any data collected will remain confidential.

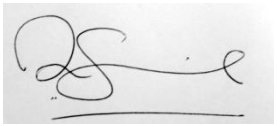
A summarized copy of the findings can also be made available to you at the end of this study. This research has been approved by the Commerce Faculty Ethics in Research Committee.

Thank you for your cooperation and time.

Should you have any questions regarding this research, please feel free to contact the researcher or the supervisor.

Sincerely,





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Appendix D- Coding Manual

Theme	**Codes**
Information Quality	Accessibility of information Right level of detail Mobile BI information easy to understand? Up to date information
Trust and Security	Protecting privacy Reliable availability and responsiveness of service Security guidelines are enforced Confidential business information
Performance Management	Delivers KPI's appropriately Completing operational tasks Better decision making Report corporate and financial performance information Strategic objectives Risks to employee objectives
Organizational Agility	Organizational culture Information loses value with time Faster response to customer requests Faster reaction to threats or opportunities in the market
Customer Satisfaction	Better customer Self Service Customer service innovation Less time to sell products and services Effective customer interactions
Strategic Business Value	How does mobile BI add value? Efficiency Customer Satisfaction Improved collaboration Improves sales and revenues Continuous improvement and learning

Code	Text	
improves efficiency	Mobile BI puts me in the market at all times. It allows me to take my clients with wherever I go. It enables me to ABC (always be closing)	P1
	Provides visibility on the health of our pipeline and provides KPI's that report on the focus & activities performed by our teams	P2
	none. mobile is used in our healthcare organization to manage employee wellbeing	P3
improves sales of products and services to customer	It creates a quantifiable visible benefit of the company products and services in a quick glance of a dashboard. That visual image speaks more than enough volumes to the customers and they will invest because the proof is there for all to see. Its both usable to protect and to generate.	P4
Information accessibility	rapid access to accurate trusted information anywhere anytime	P5
	LImited.	P6
improves efficiency	Quick time to action.	P7
Information accessibility	Information availability	P8
Information accessibility	easy and fast way of getting information	P9
competitive advantage	It helps with our position in the market and how we are perceived. Revenue - not sure if it has a direct impact	P10
	We can monitor opportunities in CRM	P11
	Nothing	P12
	It has not been implemented sufficiently enough to contribute to the organisation's competitiveness	P13
	None at the moment. There is a lack of penetration in the market. We only offer services such as running the basic BI reports off your iPads.	P14
competitive advantage	Protects businesses competitiveness as we remain on par with changing global technological changes	P15
improves sales of products and services to customer	it makes it easier to track competitors and also it makes it easier to show potential customers your solutions on the spot	P16
Information accessibility	Quicker access to information provides competative advantage	P17
	Alerts and notifications are delivered to key stakeholders on which to action	P18

customer self service	It helps customers make better and faster decisions by providing them with information and analytics	P19
improves efficiency	Dynamic flow of information, which improves communication and efficiency	P20
Information accessibility	The real time data it provides, gives us a competitive edge in the market	P21
	None	P22
	A small fraction, still not widely adopted	P23
cusomter collaboration	Enhances customer collaboration.	P24
	Major	P25
	Hight impact	P26
Information accessibility	Access to information when I need it.	P27
competitive advantage	There is no immediate link to revenue generation, but definitely competitiveness, if the info available through BI is of a strategic nature.	P28
	It keeps me close to my clients all the time and helps me provide assistance to them just by a click of the button where ever i am.	P29
	Mobile BI does not play a role in our organisation's revenues or competitiveness at the moment	P30
agility	It keeps the organisation abreast of the changing environment	P31
	None	P32
	By helping us with the ability to do a "what if" analysis and thus incerease revenue	P33
	User Specific Reports and APPs	P34

Code	**Text**	
Information accessibility	Saves time (information, instructions, reports) are sent immediately, Saves travel (do not need to go deliver information, etc), Increase my independence from a desk and chair	P1
performance management	By providing real time insight into sales pipeline and what activities staff are performing to close deals	P2
risks/threats??	by showing manager problem staff and at a more relevant level than previous reports	P3
improved employee performance management	Easy visible tracking of where we are compared to where we want to be gives every enployee the neccessary impetus to drive through their own contribution and deliver an astounding performance.	P4
Information accessibility	Access to all. At all times. Common same single view.	P5

	Limited impact.	P6
improved efficiency	Quick time to action	P7
improve decision making	Instant visibility to make decision	P8
faster response	helps us respond faster	P9
improved sales	With CRM, pricing, sales plays,.. it does. With other info that's not available on mobile apps, it doesn't	P10
improved sales	We can forecast our sales better	P11
Information accessibility	Access to reports without being at the office	P12
Information accessibility	Through its convenience of availability at any time or place	P13
	Not at the moment.	P14
performance management	By enabling organisation to respond faster on operational performance	P15
	it makes it easy to make changes to requirements if we are on the client's site and also be able to show potential customers our products/services when we are not in our base	P16
Information accessibility	Quicker access to information provides competative advantage and reduces costs	P17
	Action events as soon as they are detected based on KPIs designed to measure and monitor specific key events	P18
Information accessibility	Can respond quicker to customer requests and market changes when you have quicker access to information	P19
improve decision making	By Enabling faster decision making	P20
improves communication	Effective communication	P21
improve decision making	By having realtime data , one can make more informed decisions that will gear toward increasing revenues and meeting customer requirements more effectively	P22
Information accessibility	Enables us to access information faster allowing us to make faster decisions	P23
Information accessibility	Information on hand	P24
Information accessibility	Allowing for quick access to data that can be presented on the go in an appealing format. More so at an executive level.	P25
Collaboration	Collaboration with partners creates increased effectiveness and overall performance	P26
	Control and outcome of deal based on phase of deal	P27
	Highly	P28
improve decision making	quicker time to decision making	P29
improve decision making	Having mission-critical info available at your fingertips, regardless of your location, contribute to more effective decision-making.	P30

	By offering convenient ways of doing bussiness and bringing you close to the customers.	P31
quick customer response	Mobile BI can boost our reaction times to our customer's needs as well as reaction to weaknesses in the business,	P32
	It gives timely feedback and statistics	P33
Information accessibility	enables us to access data quickly and away from a desktop computer. information is portable	P34
Information accessibility	360 degree visibility	P35
Information accessibility	360 Degree of Customer and opportunities at any time any place.	P36

Code	**Text**	
	Everyone in organisation is using Mobile BI; every single one	P1
designing specifically for mobile	By simplyfying some of the BI reports - some have too much content crammed in which makes navigation on small screen sizes difficult	P2
increased adoption	by making it more widely available. select trial with only 25 managers	P3
	Increased use in communication, rather than one saying we are close to making our number we could adopt a visual communication strategy that just gives mobile BI maps that show a dashboard indicating how far we are. That would limit the number of words required to communicate the key message and would deliver a more long lasting message. If you can see it, you can feel it. If you feel it, it becomes real and you act on it.	P4
Training	education of internal people. encourage them to leverage it more.	P5
	One device for all purposes. Mobile BI has its foundation in accesibility and consolidation of devices.	P6
	Add additional BI components relative to employee's performance	P7
	Shout the values we have derived to our customers	P8
Training	By trainiing users on the various apps applicable to their line of business	P9
	Mobilise the operational day-to-day tasks that most people need	P10
Training	More training on the tools	P11
	Single version of the truth and not so many information sources	P12
	Mobile should be deemed as a full-scale BI platform, not just the second option to the traditional PC/laptop model	P13
designing specifically for mobile	Definitely. More resources should be allocated to developing mobile reports/dashboards that will add value for our clients.	P14
	By investing in maximisation of the system capabilities	P15

	use it more to show customers and other associate what our organisation does do. also, show customers the value if Mobile BI by example, in terms of our organisation using it more and more when meeting with clients	P16
	By developing our own mobile apps though open source applications (android etc)	P17
	Implement this at a broadbase level throughout the organisation	P18
more buyin	He buyin from senior executives and sell The value of MobileBI to the rest of the organization	P19
	Be as device-agnostic as possible, Adopt a BYOD (Bring your own device) policy, and have proper governance in place with specific principles regarding data governance.	P20
change management	Inspire a culture of Mobile BI usage	P21
change management	More change management exercises to fully adopt	P22
Training	Employee education, investment in BI consultants, encouraging use of mobile BI among staff	P23
	By better data sharing techniques	P24
	By researching area's where it can be leveraged, it is not always necessary.	P25
	Enhance stakeholder confidence through higher integrity and system availability.	P26
	Yes	P27
	by forecasting correctly	P28
	We already derive allot of value and will continue to roll out appropriate functionality	P29
more buyin	By trying to attain user buy-in. Our organization suffers from lack of interest/knowledge of mobile BI. By utilizing the tools availalble, and spreading awareness, it is the first step towards achieving ROI.	P30
	By involving the customers in coming up with better ways to service them using Mobile BI.	P31
	Our organisation can increase the value it derives by introducing electronic systems to transact with our clientele	P32
	Buy religious capturing of data	P33
	by including performance reports	P34
	It will help them know where to and where not to put in resources to optimize business as well as keeping them up to date on business activities for efficient decision makings.	P35
faster customer response	Faster responding to customer service and feedback from customers	P36

Appendix E – Frequency Distribution and Central Tendency

Table 1: Frequency distribution of Responses

Variable	Response				
	1	2	3	4	5
IQ1	2 (4%)	1 (2%)	1 (2%)	30 (55%)	21 (38%)
IQ2	0 (0%)	7 (13%)	8 (15%)	29 (53%)	11 (20%)
IQ3	1 (2%)	3 (5%)	5 (9%)	34 (62%)	12 (22%)
IQ4	0 (0%)	3 (5%)	3 (5%)	39 (71%)	10 (18%)
PEM3	0 (0%)	1 (2%)	8 (15%)	28 (51%)	18 (33%)
PEM4	0 (0%)	`1 (2%)	8 (15%)	31 (56%)	15 (27%)
PEM5	1 (2%)	4 (7%)	15 (27%)	23 (42%)	12 (22%)
PEM6	1 (2%)	5 (9%)	14 (25%)	25 (45%)	10 (18%)
ORG3	1 (2%)	6 (11%)	4 (7%)	29 (53%)	15 (27%)
ORG4	1 (2%)	4 (7%)	3 (5%)	31 (56%)	16 (29%)
ORG5	1 (2%)	7 (13%)	7 (13%)	28 (51%)	12 (22%)
CUS1	0 (0%)	5 (9%)	5 (9%)	29 (53%)	16 (29%)
CUS2	1 (2%)	4 (7%)	3 (5%)	34 (62%)	13 (24%)
CUS3	0 (0%)	5 (9%)	11 (20%)	30 (55%)	9 (16%)
CUS4	0 (0%)	2 (4%)	5 (9%)	33 (60%)	15 (27%)
SBV1	1 (2%)	3 (6%)	11 (20%)	31 (57%)	8 (15%)
SBV2	1 (2%)	1 (2%)	17 (31%)	26 (47%)	10 (18%)
SBV3	0 (0%)	6 (11%)	8 (15%)	30 (55%)	11 (20%)
SBV4	1 (2%)	6 (11%)	7 (13%)	30 (56%)	10 (19%)
N=55					

Table 2: Central Tendency, Dispersion and Shape (Distribution of Responses)

Variable	Descriptive Statistics (FinalSample)						
	Mean	Minimum	Maximum	Range	Std.Dev.	Skewness	Kurtosis
IQ1	4.22	1.00	5.00	4.00	0.88	-2.00	5.60
IQ2	3.80	2.00	5.00	3.00	0.91	-0.65	-0.18
IQ3	3.96	1.00	5.00	4.00	0.84	-1.30	2.70
IQ4	4.02	2.00	5.00	3.00	0.68	-1.12	2.85
PEM3	4.15	2.00	5.00	3.00	0.73	-0.53	0.06
PEM4	4.09	2.00	5.00	3.00	0.70	-0.46	0.31
PEM5	3.75	1.00	5.00	4.00	0.95	-0.55	0.13
PEM6	3.69	1.00	5.00	4.00	0.94	-0.58	0.16
ORG3	3.93	1.00	5.00	4.00	0.98	-1.08	0.87
ORG4	4.04	1.00	5.00	4.00	0.90	-1.33	2.18
ORG5	3.78	1.00	5.00	4.00	0.99	-0.83	0.20
CUS1	4.02	2.00	5.00	3.00	0.87	-0.91	0.53
CUS2	3.98	1.00	5.00	4.00	0.87	-1.36	2.49
CUS3	3.78	2.00	5.00	3.00	0.83	-0.57	0.04
CUS4	4.11	2.00	5.00	3.00	0.71	-0.80	1.39
SBV1	3.78	1.00	5.00	4.00	0.83	-0.97	1.66
SBV2	3.78	1.00	5.00	4.00	0.83	-0.57	1.08
SBV3	3.84	2.00	5.00	3.00	0.88	-0.69	0.06
SBV4	3.78	1.00	5.00	4.00	0.94	-0.94	0.73

Appendix F- Correlation Analysis

Pair of Variables	Spearman Rank Order Correlations (FinalSample) MD pairwise deleted Marked correlations are significant at p <.05000			
	Valid (N)	Spearman (R)	t(N-2)	p-value
PEM3 & SBV1	55	0.340351	2.635110	0.011005
PEM3 & SBV2	55	0.208970	1.555670	0.125738
PEM3 & SBV3	55	0.053618	0.390907	0.697433
PEM3 & SBV4	55	0.351583	2.734117	0.008485
PEM4 & SBV1	55	0.295632	2.252934	0.028427
PEM4 & SBV2	55	0.254169	1.913208	0.061130
PEM4 & SBV3	55	0.246492	1.851619	0.069655
PEM4 & SBV4	55	0.414292	3.313859	0.001664
PEM5 & SBV1	55	0.410987	3.282029	0.001827
PEM5 & SBV2	55	0.461791	3.790231	0.000387
PEM5 & SBV3	55	0.336766	2.603782	0.011935
PEM5 & SBV4	55	0.382330	3.012261	0.003969
PEM6 & SBV1	55	0.332648	2.567955	0.013086
PEM6 & SBV2	55	0.289546	2.202262	0.032019
PEM6 & SBV3	55	0.329283	2.538805	0.014095
PEM6 & SBV4	55	0.430037	3.467746	0.001050

Pair of Variables	Spearman Rank Order Correlations (FinalSample) MD pairwise deleted Marked correlations are significant at p <.05000			
	Valid (N)	Spearman (R)	t(N-2)	p-value
ORG3 & SBV1	55	0.389065	3.074693	0.003328
ORG3 & SBV2	55	0.432240	3.489575	0.000983
ORG3 & SBV3	55	0.477529	3.956747	0.000227
ORG3 & SBV4	55	0.339409	2.626868	0.011243
ORG4 & SBV1	55	0.340717	2.638319	0.010914
ORG4 & SBV2	55	0.394314	3.123750	0.002893
ORG4 & SBV3	55	0.417048	3.340525	0.001537
ORG4 & SBV4	55	0.327882	2.526697	0.014535
ORG5 & SBV1	55	0.487872	4.068852	0.000158
ORG5 & SBV2	55	0.346154	2.686099	0.009632

ORG5	& SBV3	55	0.511285	4.331117	0.000066
ORG5	& SBV4	55	0.476544	3.946188	0.000235

Spearman Rank Order Correlations (FinalSample)
MD pairwise deleted
Marked correlations are significant at p <.05000

Pair of Variables		Valid (N)	Spearman (R)	t(N-2)	p-value
CUS1	& SBV1	55	0.421787	3.386647	0.001340
CUS1	& SBV2	55	0.410753	3.279780	0.001840
CUS1	& SBV3	55	0.396129	3.140797	0.002755
CUS1	& SBV4	55	0.434577	3.512819	0.000915
CUS2	& SBV1	55	0.511965	4.338923	0.000065
CUS2	& SBV2	55	0.481634	4.000984	0.000197
CUS2	& SBV3	55	0.520821	4.441592	0.000046
CUS2	& SBV4	55	0.628164	5.877418	0.000000
CUS3	& SBV1	55	0.323643	2.490176	0.015938
CUS3	& SBV2	55	0.561932	4.945609	0.000008
CUS3	& SBV3	55	0.346768	2.691519	0.009496
CUS3	& SBV4	55	0.446575	3.633557	0.000632
CUS4	& SBV1	55	0.498636	4.187910	0.000107
CUS4	& SBV2	55	0.479168	3.974368	0.000215
CUS4	& SBV3	55	0.435931	3.526328	0.000879
CUS4	& SBV4	55	0.432305	3.490223	0.000981

Spearman Rank Order Correlations (FinalSample)
MD pairwise deleted
Marked correlations are significant at p <.05000

Pair of Variables		Valid (N)	Spearman (R)	t(N-2)	p-value
IQ1	& PEM3	55	0.457213	3.742656	0.000449
IQ1	& PEM4	55	0.451460	3.683417	0.000541
IQ1	& PEM5	55	0.295195	2.249284	0.028673
IQ1	& PEM6	55	0.327458	2.523032	0.014671
IQ2	& PEM3	55	0.357531	2.787085	0.007366
IQ2	& PEM4	55	0.241935	1.815242	0.075146
IQ2	& PEM5	55	0.260977	1.968147	0.054292
IQ2	& PEM6	55	0.145775	1.072716	0.288259
IQ3	& PEM3	55	0.300716	2.295496	0.025690
IQ3	& PEM4	55	0.348395	2.705879	0.009144
IQ3	& PEM5	55	0.345934	2.684160	0.009682
IQ3	& PEM6	55	0.234311	1.754654	0.085098
IQ4	& PEM3	55	0.600885	5.472679	0.000001
IQ4	& PEM4	55	0.407149	3.245252	0.002036
IQ4	& PEM5	55	0.510962	4.327418	0.000067

IQ4	& PEM6	55	0.357875	2.790166	0.007305

Pair of Variables		Spearman Rank Order Correlations (FinalSample) MD pairwise deleted Marked correlations are significant at p <.05000 Valid (N)	Spearman (R)	t(N-2)	p-value
IQ1	& ORG3	55	0.383895	3.026712	0.003811
IQ1	& ORG4	55	0.297657	2.269862	0.027309
IQ1	& ORG5	55	0.433362	3.500721	0.000950
IQ2	& ORG3	55	0.279607	2.120132	0.038694
IQ2	& ORG4	55	0.294096	2.240114	0.029300
IQ2	& ORG5	55	0.329830	2.543538	0.013927
IQ3	& ORG3	55	0.224824	1.679748	0.098893
IQ3	& ORG4	55	0.228666	1.710017	0.093112
IQ3	& ORG5	55	0.375433	2.948906	0.004736
IQ4	& ORG3	55	0.246482	1.851542	0.069666
IQ4	& ORG4	55	0.322674	2.481859	0.016274
IQ4	& ORG5	55	0.214808	1.601201	0.115277

Pair of Variables		Spearman Rank Order Correlations (FinalSample) MD pairwise deleted Marked correlations are significant at p <.05000 Valid (N)	Spearman (R)	t(N-2)	p-value
IQ1	& CUS1	55	0.419470	3.364054	0.001433
IQ1	& CUS2	55	0.388352	3.068057	0.003391
IQ1	& CUS3	55	0.252238	1.897681	0.063191
IQ1	& CUS4	55	0.245589	1.844404	0.070716
IQ2	& CUS1	55	0.336667	2.602920	0.011961
IQ2	& CUS2	55	0.361424	2.821963	0.006705
IQ2	& CUS3	55	0.393302	3.114266	0.002973
IQ2	& CUS4	55	0.155800	1.148259	0.256018
IQ3	& CUS1	55	0.404792	3.222769	0.002174
IQ3	& CUS2	55	0.390380	3.086949	0.003214
IQ3	& CUS3	55	0.295347	2.250554	0.028587
IQ3	& CUS4	55	0.282896	2.147226	0.036369
IQ4	& CUS1	55	0.348259	2.704678	0.009173
IQ4	& CUS2	55	0.345807	2.683040	0.009710
IQ4	& CUS3	55	0.221333	1.652310	0.104384
IQ4	& CUS4	55	0.192836	1.430720	0.158380